APR 15 1929

Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

Chicago, April 13, 1929 (Issued Every Other Week) Volume XXXII, No. 8

21 months average hot zone lining life

where former records were 3 to 5 months

In 8 kilns of this prominent cement plant ARCOFRAX High Alumina Brick have given many times the life formerly obtained in hot zone linings when high grade fire clay brick were used. The other 3 kilns are still in service. Read the complete record—

In Plant No. 1

No. 1 Kiln—Lined May 10, 1926—Ran until March 9, 1928	22 months
No. 2 Kiln—Lined May 10, 1926—Ran until May 15, 1927	12 months
No. 3 Kiln—Lined May 10, 1926—Ran until Feb. 21, 1928	over 21 months
No. 4 Kiln—Lined May 10, 1926—Ran until Feb. 19, 1928	over 21 months
No. 5 Kiln—Lined May 5, 1928	Still in service
No. 6 Kiln—Lined Jan. 4, 1928	Still in service
No. 7 Kiln—Lined May 10, 1926	31 months and still in service
No. 8 Kiln—Lined Aug. 8, 1928	Still in service

In Plant No. 2

No. 1 Kiln—Lined May 10, 1927—Ran until Oct. 1, 1928	almost 17 months
No. 2 Kiln—Lined May 10, 1926—Ran until May 1, 1928	almost 24 months
No. 4 Kiln—Lined May 10, 1926—Ran until Nov. 27, 1927	over 18 months

You may be able to reduce your refractory costs by using ARCOFRAX High Alumina Brick. Let us show you how others are doing it.

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HOLDERBANK PORTLAND CEMENT CO.
SWITZERLAND

ADRIATIC PORTLAND CEMENT CO.
SALERNO, ITALY

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CEMENT PLANTS
THROUGHOUT THE WORLD

The supremacy and recognized leadership of Polysius Equipment is reflected in the installations in these plants scattered over the four corners of the globe.

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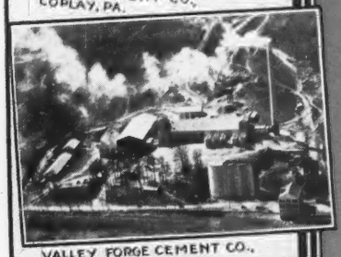
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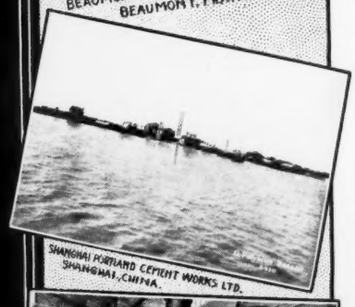
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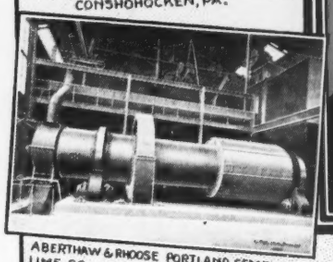
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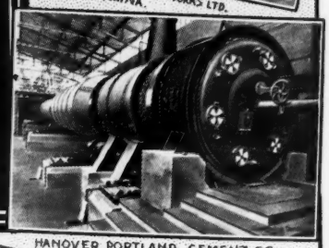
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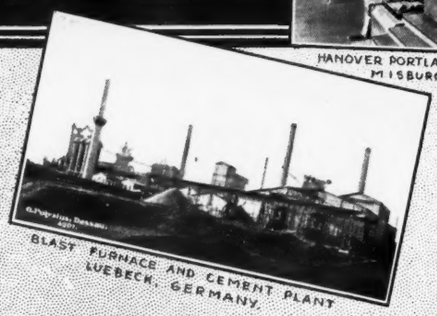
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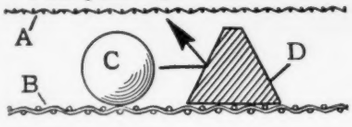
LUEBECK, GERMANY.

ROTEX

The popular No. 46 ROTEX with the new type R spiral bevel gear drive, shown below, has a screen surface 3 ft. by 7 ft. and quantity production makes possible the very low price of $620.00. This model includes all of the features of the larger "Heavy Duty" series, including the double balance wheel system for preventing the transmission of vibration to the foundation of the machine.



A—Screening mesh.

B—Coarser ball supporting screen.

C—The solid rubber balls flying about, due to the gyrating action of the screen box, strike the inclined surface D and are deflected upward, hitting the under side of the screening mesh.

For Producing Fine Sizes!

IN practically every plant there is a need for a screen that will produce clean, marketable grades of the finer sizes.

The ROTEX Screen No. 46 shown above is designed and built with this purpose in mind.

The nearly level gyratory motion of the screen box insures accurate sizing while the patented "ball-and-bevel-strip" mesh cleaning system (diagrammatically explained at the left) insures a continuously clean, open screen.

Of a convenient size to produce tonnage and use a minimum space, it is, at the same time, flexible in operation and ruggedly built to give good service.

This machine can probably be used to advantage in your plant. We would appreciate the opportunity of sending complete details to you.

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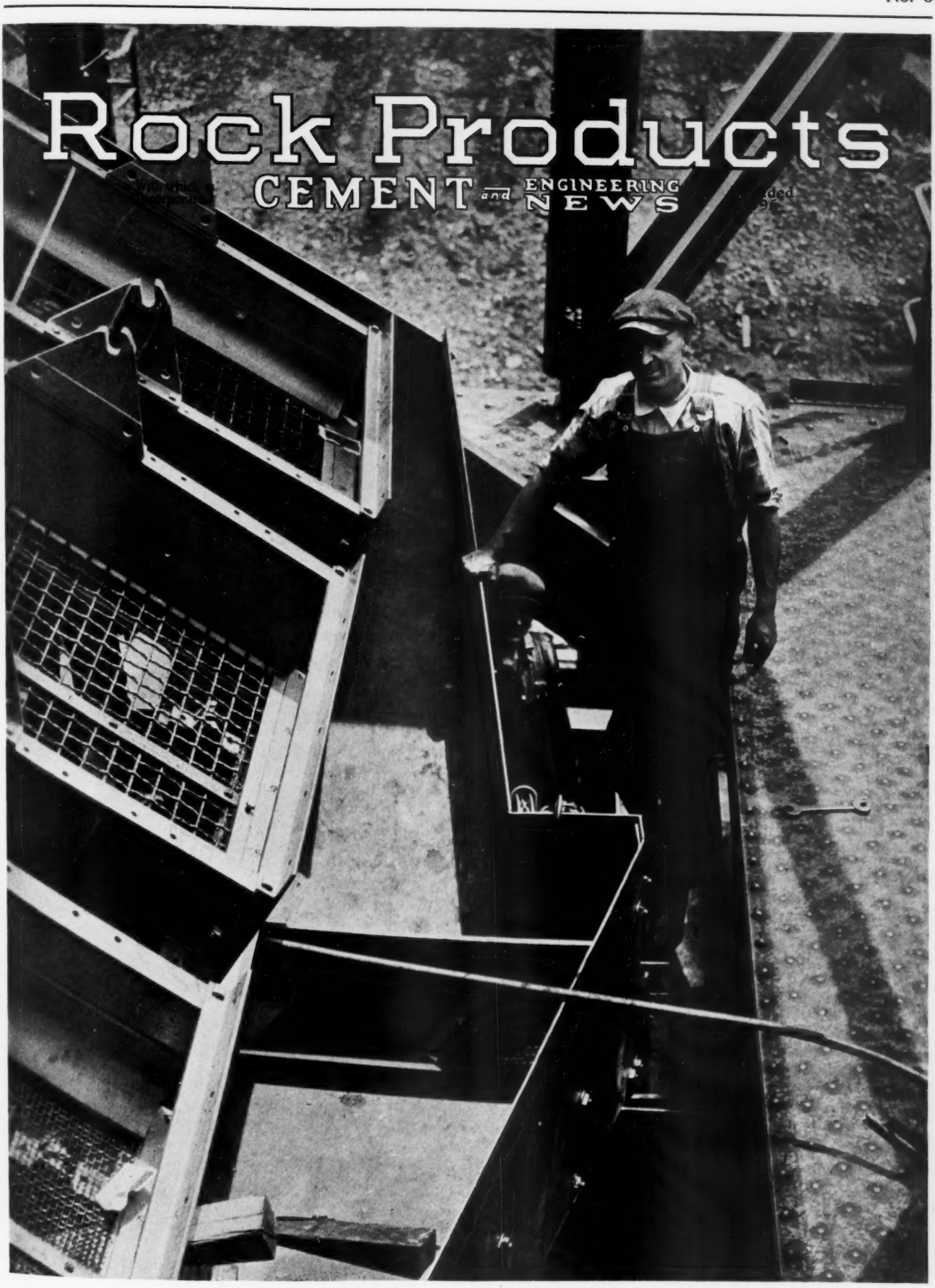
Volume XXXII Chicago, April 13, 1929 No. 8

Rock Products

CEMENT and ENGINEERING NEWS



Part of screen and chute installation on the Ohio River Sand Co.'s dredge "Kentucky"

A New Type of Dredge "Kentucky" of the Ohio Sand Company Has Unusual Features

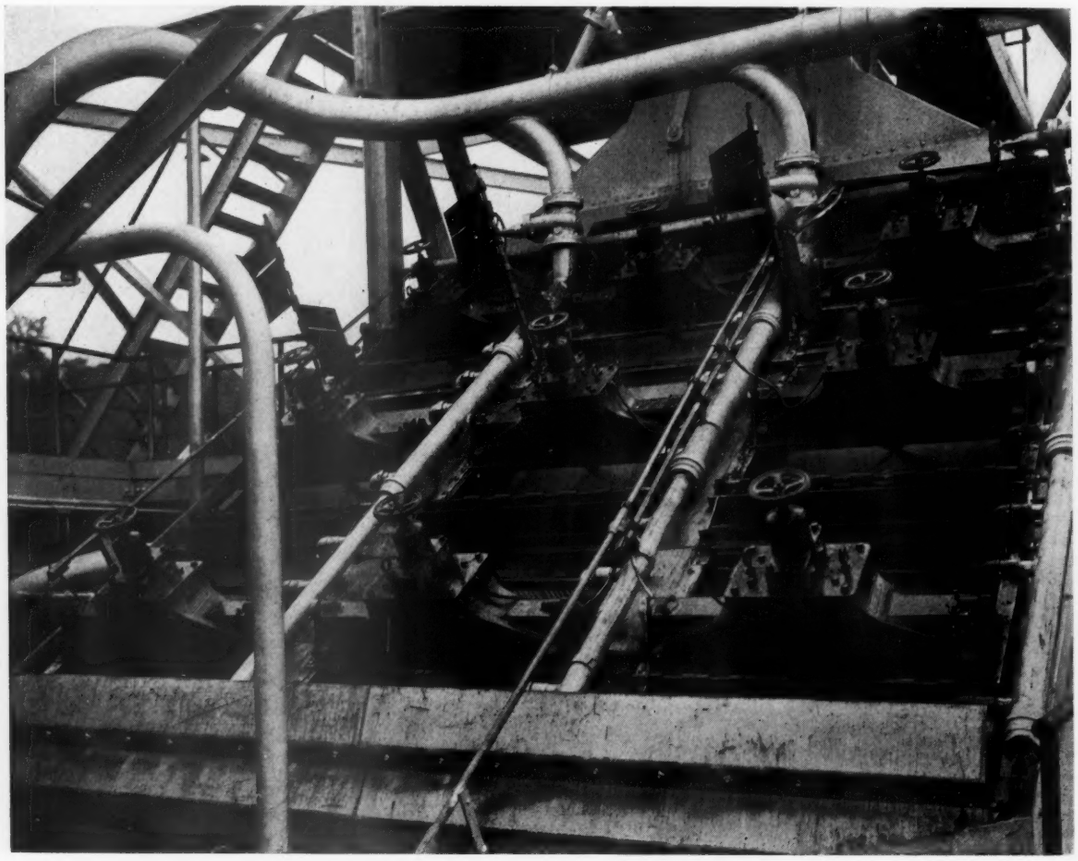
THE OHIO SAND CO.'S sales yard at Broad and River streets, Louisville, Ky., has long been one of the "show" yards of the sand and gravel industry. The well designed unloading equipment, storage facilities and well kept yards are of very pleasing appearnce, even after five years of successful operation. This plant was described in an earlier issue of ROCK PRODUCTS.

A recent acquisition of the company is the digger dredge *Kentucky*, the keel of which was laid March 12, 1928. The dredge was completed in April of the same year. The first operation or trial run, however, was not made until July 24, 1928.

Vibrating Screens for Sizing

This dredge is probably the only one in the world that uses vibrating screens mounted on the deck. It is of steel construction throughout, and was designed and built by the Dravo Contracting Co., Pittsburgh, Penn., after an extended trip by R. N. Coolidge, engineer for the Dravo company, and J. H. Duffy, general manager of the Ohio Sand Co., in which practically all of the latest dredges were visited. This inspection trip crystallized the previously held opinions of the sand company of the desirability of using vibrating screens for sand and gravel classification, and the subsequent operation of this installation has more than justified their selection.

Captain Duffy called the visiting editor's attention to the fact that the crew could make an entire change of screens in five



Battery of nine vibrating screens mounted on the deck of the "Kentucky." The upper six screens and one of the lower screens remove the sand, while the other two act as scalpers for the removal of the oversize material

Dredge

The all-steel dredge "Kentucky" of the Ohio Sand Co. This dredge is probably the only one in the world with vibrating screens so mounted on the upper deck

hours, and to the small area of effective screening surface in a rotary screen; also to the higher grade products of the vibrating screens. His statement that with a rotary screen they would not be able to produce a marketable product from the sand beds they are now working is significant, coming from a man who has spent his entire life in that business, having followed in the footsteps of his father, who was one of the early sand and gravel producers of Louisville.

The dredge is equipped, however, with a rotary scalper or washer, as it is more correctly designated. This first screens out the finer sands, after which the coarser sizes pass to the middle section, where they are subjected to a series of high pressure water nozzles, and the product at the same time is tumbled into the solid tubular section of the washer, where any clay material is disintegrated. This middle section is also provided with a series of angle iron baffles, or projections, that pick the material up and let it fall with the rotation of the washer. hTe material after passing through the washer section goes to the end screening section, and the oversize (plus 2½-in.) falls back to the river through a chute. The fines from this washer-screen all unite, there being no classification or separation in this unit.

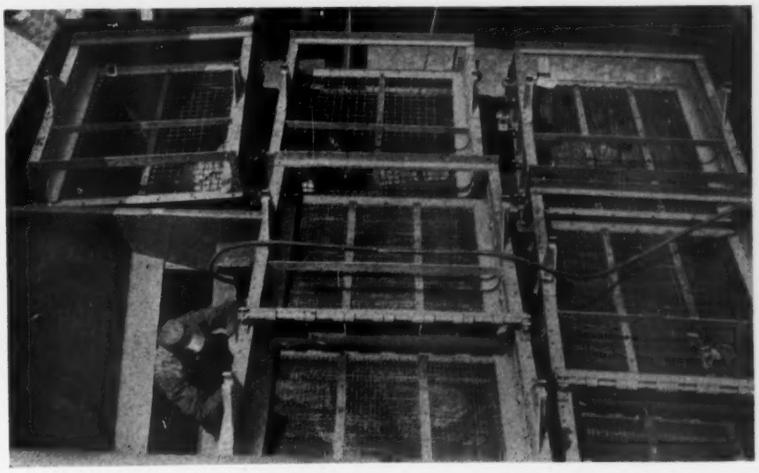
Ladder-Bucket Features

The hull of the dredge is 155 ft. long, 44 ft. wide and 8 ft. deep, and draws 6½ ft. of water. The digging ladder is 89 ft. long and is equipped with 84 specially designed Dravo type, manganese-steel buckets, each holding 4⅓ cu. ft. of material. The bucket ladder is raised and lowered by 1-in. hemp-centered, wire rope that passes over gravel sheaves, and is powered by an 8½x10-in. Lambert single-drum hoisting engine. About 800 ft. of wire rope is used on this digging ladder. The digging-ladder, hoisting engine, as well as the two 7x8-in. Osgood wracking engines, is mounted aft and on the main hull deck. The wracking engines are placed one on each side of the digging ladderway and near the outer edges of the hull. The bucket line can dig to a depth of 61 ft. and elevates the material at the rate of 32 buckets per minute. On this basis the dredge has a capacity of 320 yd. or 450 tons sand and gravel per hour.

Self-Cleaning Grizzly

The discharge from these buckets passes over a 45-deg. angle bar grizzly spaced to 5-in. centers, the oversize falling back into the river. Each grizzly bar is connected at its upper end to a piston rod that can be raised to almost a vertical position or jarred so that any material that jambs between the bars can be thus loosened and allowed to fall back into the river. The steam cylinders that drive the pistons are all controlled from the pilot house, as are all the various operating units of the dredge.

The fines from the grizzly fall into a rectangular wash tank which serves as the boot for No. 1 bucket elevator. This elevator has 43 buckets, similar to those of the digging ladder, but hold only 4 cu. ft. each instead of 4⅓. These elevates the material 30 ft. above the decks, and 22 ft. horizontally, discharging to a steel apron that de-



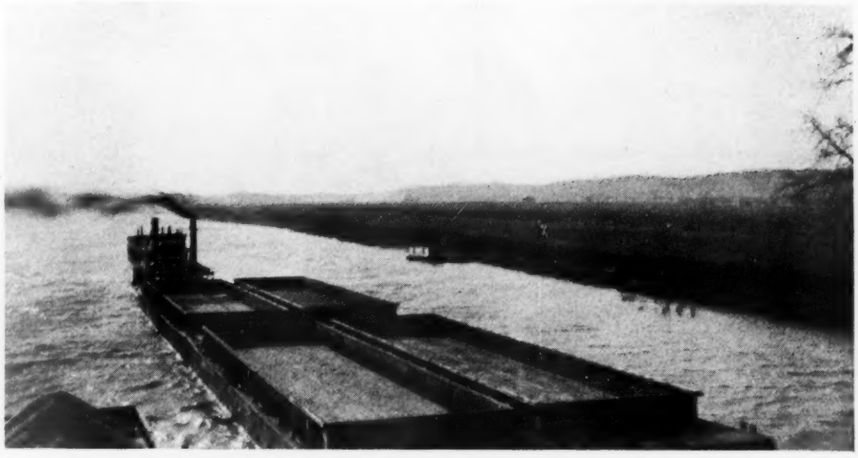
View of the battery of vibrating screens during their installation

livers the sand and gravel to the rotary washer previously referred to.

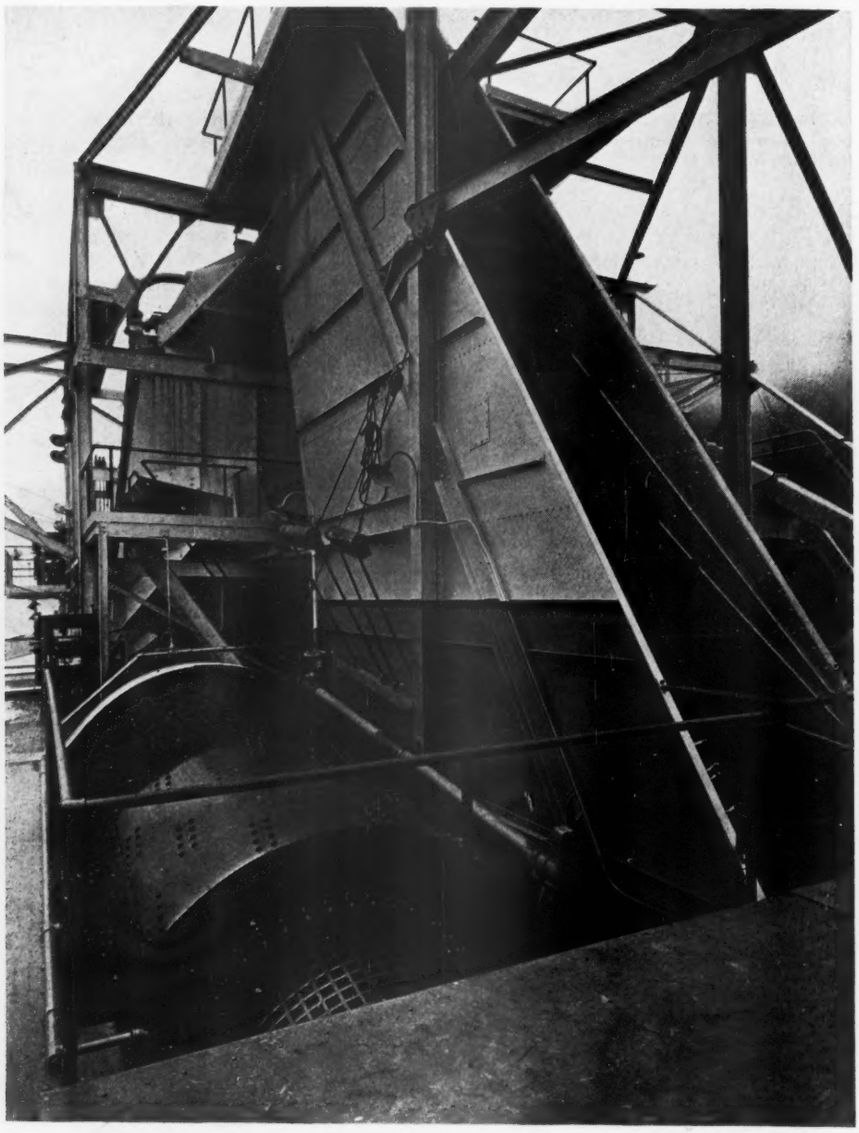
Washing

This washer is 24 ft. long and is provided with an outer jacket of ½-in. wire cloth, 8 ft. long and 7-ft. solid outer section, both 9 ft. in diameter. The inner portion is provided, at the feed end, with 8 ft. of 1-in. perforations, then a 7-ft. solid section and a 6-ft. section of 2½-in. square perforations. The solid sections and inner screening areas are of manganese-steel plate. Water is supplied through a 6-in. horizontal pipe up to the solid section, where the water discharges through 10 to 15 nozzles, so placed that they strike the bed of material in the bottom of the drum. This water has a nozzle pressure of 60 lb. per sq. in.

The fines from this operation all discharge to a common pit, where they are



The stern-wheeler "Duffy" delivering sand barges to the "Kentucky" for loading near 62-mile Island on the Ohio river above Louisville—note the hopper flush deck type use by this company



Washer screen, showing the solid center section. Bolt heads indicate the location of the baffle plates. The elevator at the right carries the material to the vibrating screens

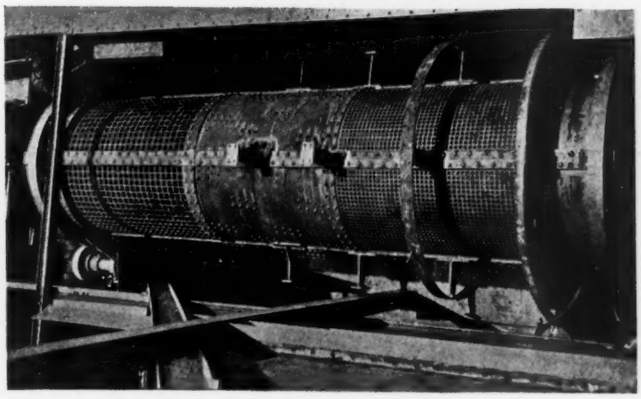
picked up by bucket elevator No. 2, which is equipped with 52 buckets of the same type as No. 1 elevator, and this minus 2½-in. material is elevated to a vertical distance of 48 ft. and moved horizontally 26 ft., discharging to a battery of nine Hum-mer screens arranged in three parallel units of three screens each. Elevators No. 1 and No. 2, the digger bucket line and rotary screen are all driven by a 230-hp., 16x16-in., 200-r.p.m. Skinner Uniflow steam engine through a countershaft that serves the various units. The digging buckets are geared directly to this countershaft, but the other units are driven from a jack shaft by both chain and enclosed gear drives. The jack shaft is driven from the countershaft by an enclosed chain drive. The engine is belted to the countershaft and this belt is protected from slippage, due to overloads such as are encountered when digger buckets strike a submerged obstacle, by a Dravo friction clutch that is mounted on the countershaft and is a part of the driven pulley from the prime mover.

Arrangement of Screen Battery

The material as it discharges to the screens is divided into three equal portions by a suitable baffle arrangement, and the sand and gravel then cascade over the three sets of screens that are arranged one above the other and in the same place, although set at an angle of approximately 45 deg.

In this series of three cascades, two of the series of three screens are identical and are provided with ¼x1-in. cloth for the upper screen, the middle screen with the same and the lower screen is of 2-in. mesh. The third series of screens differ in that the last or lower screen is provided with ⅝-in. mesh cloth and serves the purpose of introducing a small amount of pea sized gravel into the finished sand.

The fines from the six upper screens flow at right angles to the cascading material to a second set of three screens, each screen

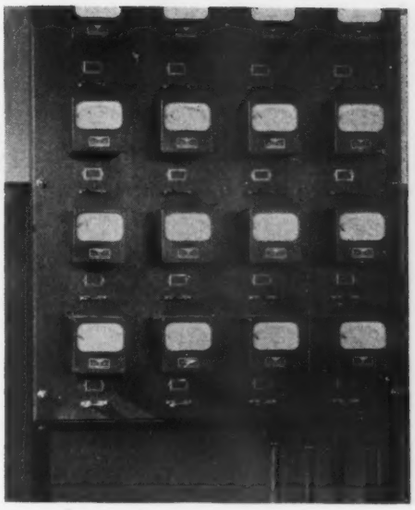


The washer screen with its jacket removed

receiving one-third of the material. These three screens at the time of inspection were provided with ¼-in. mesh cloth, but this mesh will vary from ¼-in. to 3/32-in., depending on the product wanted. Two of these screens were performing their proper functions, although the material fed the third was being by-passed so as to allow what would be one-third of the pea gravel from the previously mentioned ⅝-in. screen to become a part of the finished sand. The fines from these "cleaner" screens discharge by gravity to the boot of a chain-bucket elevator that delivers the sands to a chute that serves the sand barges. The oversize from the "cleaner" screen falls to a second elevator that discharges to a chute that can serve a barge, but at the time of visit this oversize was being wasted.

Gravel Sizing

The gravel oversize from the battery of nine Hum-mer screens falls to a chute that serves a single Hum-mer screen, 2-in. mesh cloth, that acts as a final cleaner of oversized gravel. The fines from the screen fall to a chute and are discharged to the barge,

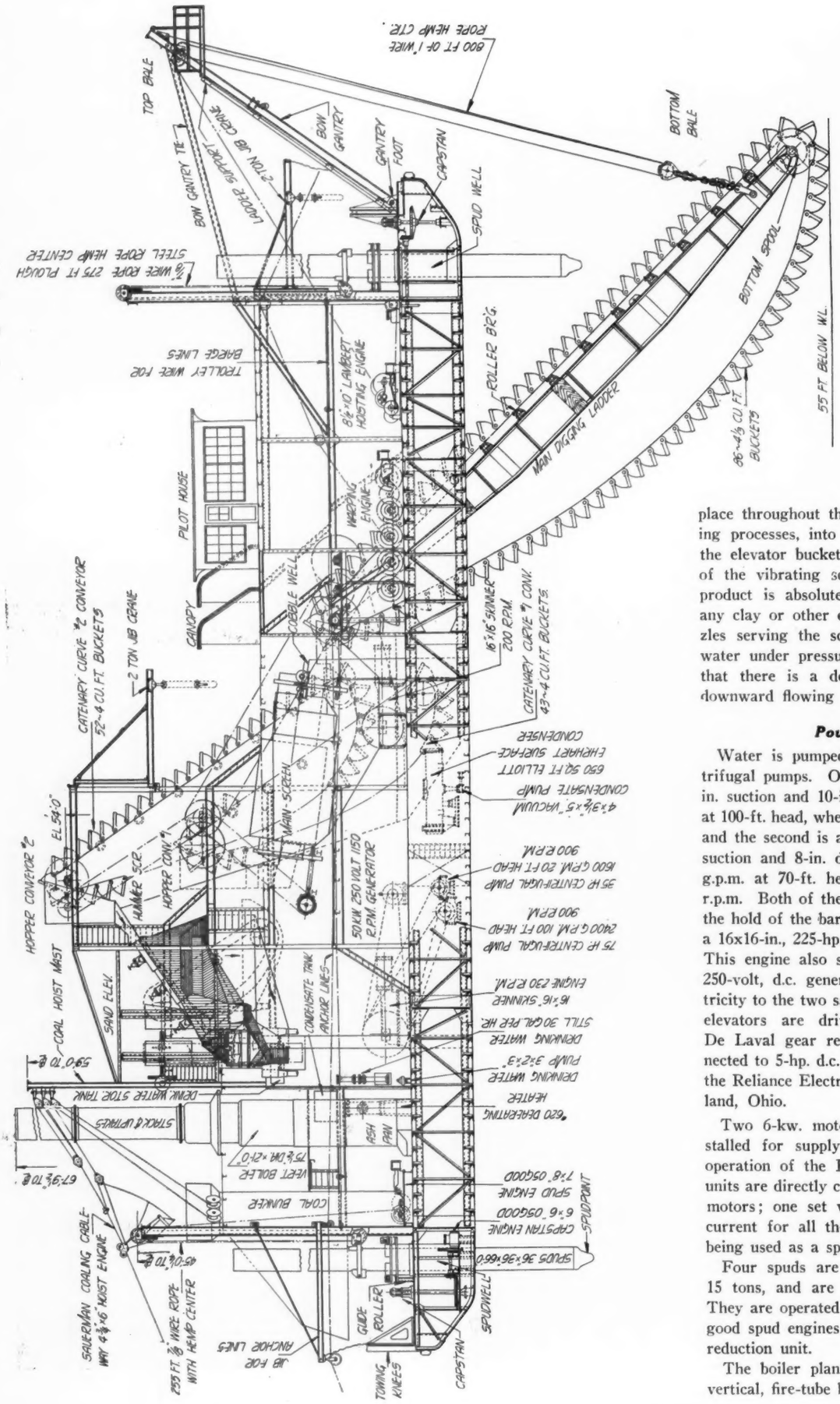


Battery of 16 indicating ammeters used in connection with the vibrating screens

and the small amount of oversize falls into the river and is wasted.

Water under pressure is used at every

These three vibrating sand screens remove any oversize, and can supply a wide range of sand sizes



Sectional view of the all-steel dredge "Kentucky." The main digging ladder will excavate at a depth of 55 ft. below the water line

place throughout the conveying and screening processes, into the elevator boots, into the elevator buckets themselves, and on all of the vibrating screens, so that the final product is absolutely clean and free from any clay or other earthy matter. The nozzles serving the screens are supplied with water under pressure and in such amounts that there is a decided tendency for the downward flowing sands to be held back.

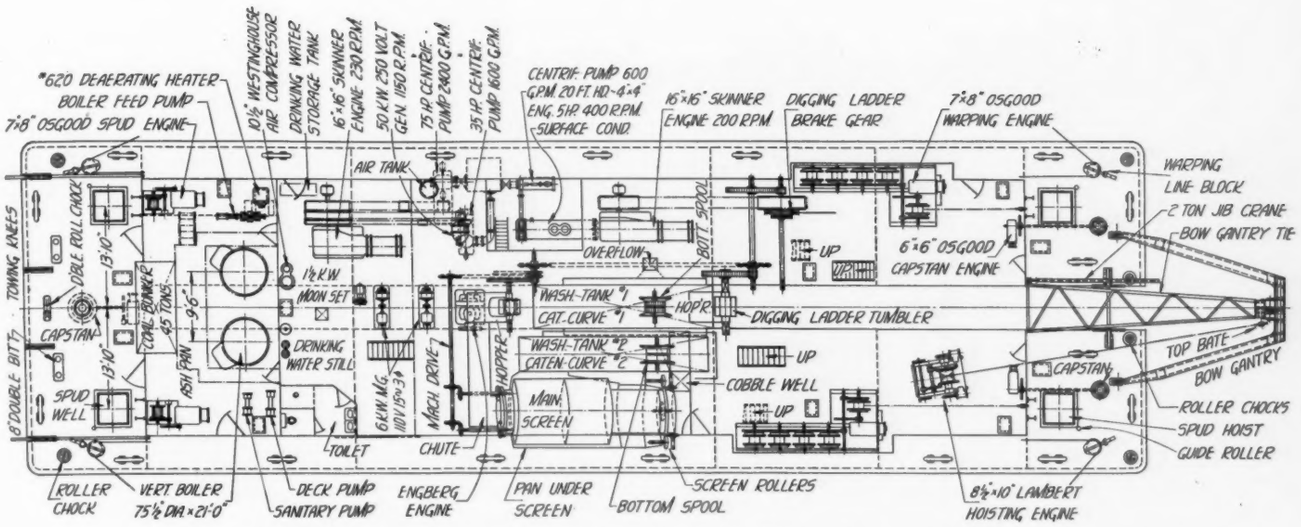
Power Plant

Water is pumped by two De Laval centrifugal pumps. One is rated at 75-hp., 12-in. suction and 10-in. discharge, 2400 g.p.m. at 100-ft. head, when operating at 900 r.p.m.; and the second is a De Laval, 35-hp., 10-in. suction and 8-in. discharge, delivering 1600 g.p.m. at 70-ft. head, and operated at 900 r.p.m. Both of these pumps are mounted in the hold of the barge and are belt-driven by a 16x16-in., 225-hp. Skinner Uniflow engine. This engine also serves to drive a 50-kw., 250-volt, d.c. generator for supplying electricity to the two sand elevators. These two elevators are driven through right-angle De Laval gear reduction units, direct-connected to 5-hp. d.c. motors, manufactured by the Reliance Electric and Engine Co., Cleveland, Ohio.

Two 6-kw. motor-generator sets are installed for supplying a.c. current for the operation of the Hum-mer screens. These units are directly connected to 5-hp. Reliance motors; one set will supply the necessary current for all the screens, the second set being used as a spare.

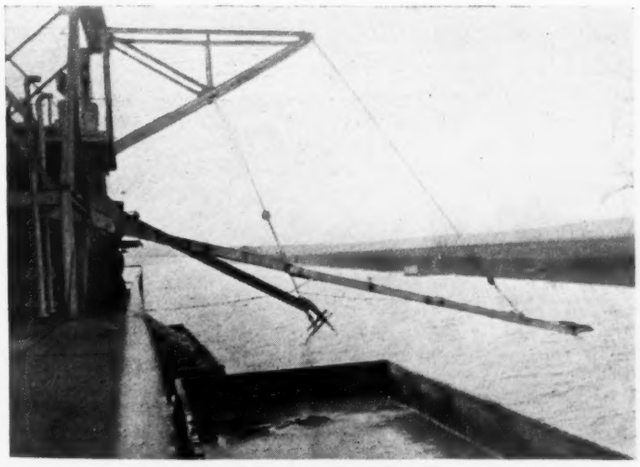
Four spuds are provided, each weighing 15 tons, and are 36x36-in. by 65-ft. long. They are operated by individual 7x8-in. Osgood spud engines through an inclosed gear reduction unit.

The boiler plant consists of two 150-hp. vertical, fire-tube boilers, made by the Ames



Plan of the steel dredge "Kentucky" showing the location of the operating machinery, boilers and engines

Iron Works, of Oswego, N. Y., which are 75½ in. in diameter and 21 ft. high, each having 188, 2½-in. tubes and operating at 175-lb. pressure. Coal is delivered to the dredge in scows and is unloaded by a Sauerman coaling cableway operated by a 4¾x6-in. hoisting engine. The Sauerman bucket discharges to a 45-ton capacity steel bin that is conveniently located with respect to the boiler room. Other equipment in the boiler room consists of a No. 620 Cochrane deaerating heater and a 650-sq. ft. Elliott-Ehrhart surface condenser.



The discharge spouts. The shorter spout delivers sand to the barge and the longer spout returns the oversize to the river

The dredge requires a crew of 10 men, and operates on one 10-hr. shift; the men are comfortably housed in quarters near the digging end of the dredge, where also are located the dining room and kitchen. Water for domestic purposes is provided from a 30-gal. per hr. still, and this water is cooled by a refrigerating plant, that is one of the unusual features of this boat.

In the entire installation there are 13 screens and 15 vibrating heads, as three of the Hummers are of the "Bull-Dog" type. The screen heads are each provided with a Sewell Electric Instrument Co. indicating ammeter. These instruments are located on a panel in the control house.

The executive and operating offices of the Ohio River Sand Co. are at River and Broad streets, Louisville Ky., and T. J. Duffy is president; J. T. Duffy, vice-president; J. M. Settle, secretary; C. F. Bohmer, treasurer; Capt. J. H. Duffy, general manager, and Frank Longshore, dredge captain.

Flotation Possibilities for Rock Products

THE FLOTATION process has not been much applied in the rock products field, its best work being in the recovery of metallic minerals. There is a chance, however, that it may be used more with nonmetallic minerals.

Recent work on the relation of the pH value (hydrogen-ion concentration) of the flotation liquid to the recovery of different minerals is described in a paper by A. M. Gaudin, in the January number of *Mining and Metallurgy*. Both quartz and feldspar were found to be readily floated with the addition of copper sulphate in small quantity, and if the pH value was controlled it was found possible to effect a separation between them, although recovery was not good.

The paper is largely confined to the flotation of metallic minerals, but it clearly shows the effect of varying pH concentrations in the flotation circuit on different minerals, both metallic and nonmetallic. And this suggests the possibility of applying the process to a wider field. The process would be too expensive to have a wide application in the recovery of rock products, but this might not be an objection where very pure products were wanted.

The steel dredge "Kentucky" at work loading sand barges near the shore of the Ohio river, above Louisville, Ky.

Rationalization of Shaft Lime-Kiln Design—Part 1

Developing a Basis for Comparison of Kiln Performance

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IT IS DIFFICULT to think of any industrial equipment about which less is known as regards its proper dimensions for a given desired performance than that of a lime kiln; and even what is known has been mainly determined by empirical means with little consideration for sound scientific fundamentals.

At a point where the flame enters the kiln there are four possible directions for it to take; down into the cooler, up to the storage zone, across to the other eyes and sideways along the wall; and about every one of these we are more or less in doubt. Something is known, of course, but that was determined by hit-and-miss methods, and while it may be entirely correct under certain particular conditions, it may be quite wrong under any other operating condition. There are kilns of almost the same shaft cross-sectional dimensions which in one plant have an output of 10 tons of lime per day and in another 22½ tons. Why the difference? Why are some kilns twice as high as others? Why do some kilns have coolers twice as deep as others? Why have some kiln shafts cross-sections of 6x12 or 9x12 or 7x16 or 4x7 or only 2x8 ft.? Are these extremes justifiable and what is the reasoning on which they are based? Is this reasoning sound?

Fundamentally, the purpose of a lime kiln is to heat the stone; and since heat is absorbed by the surface only, the more surface there is, the more heat will there be absorbed, provided heat is available for such absorption. The more stone there is in the kiln, the more heat absorbing surface will there be; but whether this surface will be working is a different matter altogether. To have a large kiln, a kiln having a large amount of stone, that is of possible heat-absorbing surface, may do but little good if the amount of burning gas is insufficient to properly fill out the kiln shaft. In fact, a large kiln supplied with heat out of proportion to its size may actually perform worse than a smaller kiln. In one instance in which this was demonstrated to the writer, the kilns had a shaft 6½x7½ ft. before being enlarged by burning out, and the output was only 8 tons per day. In another instance the kiln had a shaft dimension of 4⅓x6⅔ ft. and the output was 13.5 tons per day. The first is the lowest capacity as compared with kiln size encountered by the writer, the second produced two and a half times as much lime in spite of the fact that both operated with natural draft.

Comparing Kiln Capacities

To say a kiln has a certain output means little to the investigative person. He would also want to know what size the kiln is; but the size may be expressed in several different ways. For guidance, the following table was calculated giving dimensions and outputs of four different kilns. Kiln *A* is the above mentioned low capacity kiln, hand-fired, natural draft operated. Kiln *B* is the kiln also mentioned above having a high capacity for its size, gas-fired with natural draft. Kiln *C* is a large, gas-fired, induced-draft kiln having very high capacity. Kiln *D* is an ordinary hand-fired kiln of which there are hundreds in use.

TABLE 1—OF COMPARATIVE KILN CAPACITIES

1. Kiln	*A*	*B*	*C*	*D*
2. Output tons of lime per day	8	13.5	60	11
3. Shaft dimensions	6½x7½ ft.	4 ft. 4 in. x 6 ft. 10 in.	6x12 ft.	5x7½ ft.
4. Shaft area at eyes, sq. ft.	45	30	70	37.5
5. Storage zone height	10 ft.	28 ft. 2 in.	18 ft.	.....
6. Shaft height above firing level	20 ft.	20 ft. 7 in.	42.6 ft.	34 ft. 6 in.
7. Cooler depth below firing level	10 ft.	8 ft. 6 in.	17.6 ft.	9 ft.
8. Total height draw gates to top	39 ft.	39 ft.	78 ft.	43 ft.
9 Cooler space, cu. ft.	400	165	1070	240
10. Shaft space, cu. ft.	1300	665	2970	790
11. Storage zone space, average effective	840	335	1710	1240
12. Average working cubic feet of shaft and storage zone space	2140	1000	4680	2030
13. Total kiln space, effective and ineffective, including cooler	2300	1435	6470	2490

Table 1 gives the dimensions of the different parts of the four kilns. The shaft space may be considered approximately as the burning zone, storage space as the preheating zone, and the cooler as the lime-cooling zone. Where the exact demarkations occur between these three processes is generally not known, and at least in the case of Kiln *A* the preheating zone extends into the shaft for a considerable distance. In some kilns lime burning is also done part way down into the cooler. All of these zones overlap to a considerable extent.

However, while a kiln may have a certain height—a certain cubical content—the entire height and space may not be utilized. When the kiln is full after charging, the true working height is naturally different from what it is when the kiln is partly empty. Then, also, even when the kiln is full it will not be level full, there will be some empty space in the storage zone. To enable intelligent comparison of different kilns an allowance must be made for this; the amount of deductions will depend on the number of times the kiln is charged a day. In case of Mount* type kilns no deduction is needed, since these kilns have the active zone always full of rock; in other cases the amounts vary as follows:

Rock charging periods per day	Cu. ft. deduction for each ton of lime made per day
1	24
2	20
4	16
6	12

If the draw is 10 tons a day and the kiln is charged once a day, the deduction for periodic kiln space inactivity is 240 cu. ft. If the same kiln is charged six times a day, then only 120 cu. ft. is deducted. On a large kiln making 60 tons, charged six times a day, the deduction from the total space is 720 cu. ft., the remainder being working space.

To Determine Kiln-Heating Surface

It is not entirely necessary for us to know what heat absorbing surface these kilns contain; still such knowledge may help to clarify the subject. To determine this, certain assumptions are necessary. They are, that in the charged kiln the voids between the rock are one-third of the kiln volume; that the size of the average stone fed to the kiln is 8 in. If these two assumptions do not vary each cubic foot of kiln capacity contains

*The kiln designed by W. D. Mount of Roanoke, Va.

6.00 sq. ft. of heat-absorbing surface. Since, however, there are irregularities in stone surface, arrangement and size, the surface will be more likely 7.00 sq. ft. per cu. ft.

Knowing approximately the surface, we are enabled to rate the kilns as boilers are rated, which is on the basis of evaporation per square foot of heating surface, and boiler size in terms of number of square feet of heating surface. Without such a definite figure one does not know if 15 tons of lime per day from a kiln is a good or a poor output. Boilers and kilns, while quite different in other respects, have it in common that heating surface determines the capacity of both. Of course, there may be working and idle surface in both boilers and kilns. For surface to work in either, hot gas must come in contact with it continuously, and the gas be removed as soon as cooled. Parts of boiler surface do but little work. This same statement, only emphasized, can be made for the lime kiln; proper arrangement of surface and sufficient heat, properly distributed, determines efficiency as well as capacity of both.

While in boilers cubic feet of space means little, in kilns there is a definite relation between surface and space, and so it is optional which to use for rating purposes. In a way it appears that cubic-foot capacity is the better, because it can be readily determined and remembered, excepting only when heat transfer calculations are made, in which case, for comparison with other types of heat transfer apparatus, the surface method of rating must be used.

In Table 1 the dimensions of the four kilns were given; Table 2 distributes the capacity along possible dimensional methods of expression. In the previous tabulation only a very hazy idea was obtained as to whether a kiln operates at high or low ratings. In the following this point is brought out rather plainly.

It will be noted that the output of *C* kiln per square foot of shaft area is much larger than any of the others. The lime passes down through the shaft very rapidly, which of course means that the gas passes up through the shaft quite rapidly. Such high rates are impossible without mechanically induced draft; with natural draft and high calcium limestone hardly more than that shown under *B* should be expected. This question of gas flow will be taken up later on in greater detail, since it is really the determining factor of kiln capacity. Note particularly the comparatively very low output of *A* kiln.

In the fourth line of the tabulation, the average kiln cross-section of both burning and storage zones is used. The contrast between *A* and *C* appears even greater. Gas flow in *A* kiln must be extremely sluggish. The difference between lines 4 and 3 of the tabulation is, as should be remembered, due to a very wide storage zone.

In line 5, kiln performance is judged by the lime output per cubic foot of burning and storage zones. Here *B* kiln shows the higher capacity. This difference exists because *C* kiln is much higher. It thus becomes apparent that a kiln may have a high capacity if judged on the shaft cross-section area basis and a low capacity if judged according to cubical content basis. The question arises as to which is better, a small shaft and high kiln, large shaft and low kiln, or a large shaft and high kiln. Kiln *A* is a large-shaft, low-kiln. Kiln *B* is a small-shaft, low-kiln, and kiln *C* is a large-shaft, high-kiln. Kiln *A* certainly is a poor performer. As to *B* and *C* there is not so much choice; but after taking everything into consideration, including kiln repairs per ton of lime, kiln costs, operating expenses, kiln *B* is too low in height and too small in cross-section, with an entirely too small cooler and storage space; while to some, kiln *C* may appear slightly too large in shaft dimensions and somewhat too high. It is safe to state, however, that higher kilns than *C* are not necessary, and they may be somewhat lower; also, considering the large and still comfortable output this kiln has, a larger shaft is not necessary and may be quite troublesome. A shaft of 6x12 ft. is satisfactory, provided the fuel-burning arrangement is such that there is always enough gas to fill out the shaft.

On line 6 it will be noted that lime passes through the burning zones of *B* and *C* kilns with about equal rapidity, but only very slowly through *A* kiln.

Since there is a direct relation between the kiln's cubical content and the amount of lime and limestone it will hold, lines 8 and 10 were incorporated; and the deduction is that in *A* kiln it takes the stone over a week to pass through the preheating and burning zones, while in *B* it goes through in a little over two days. In *C* kiln it takes a little more time because it is held up somewhat longer in the very large preheating zone, but after it gets into the burning zone it travels slightly faster than that in *B* kiln.

Limestone surface, if stone is dry and of pure calcium variety, has to absorb about 2136 B.t.u. for every pound of lime made. Of this 1378 B.t.u. is the heat of decomposition, the balance is heat of preheating (638 B.t.u. to heat the stone up to 1650 deg. F. and 120 B.t.u. to heat the lime up to 2200 deg. F.). The heat of preheating becomes again available, part as heat in the carbon dioxide given off, and part as sensible heat in the lime which may be utilized in a properly constructed kiln for air preheating. Nevertheless all of this heat has to pass first into the calcining lump of limestone. In the following tabulation an attempt is made to determine the heat transfer rate.

Kiln *B*, as shown by the heating surface in line 3, is less than half as large as *A*, still the lime output is considerably greater. For a given size *B* makes 3½ times as much lime as *A*; each square foot of exposed lime and limestone surface in *B* absorbs 345 B.t.u. per hour, while in *A* only 95 B.t.u. are absorbed. In the figures for heat transfer rate per square foot of surface per degree of temperature difference, the difference between the different kilns is surprisingly great.

To know heat transfer one must first know temperature difference. In the case of a lime kiln it is impossible to determine it exactly,

TABLE 2—KILNS RATED BY CROSS-SECTIONAL AREA AND CAPACITY

		A	*B*	*C*	*D*
1.	Kiln				
2.	Output per day, tons	8	13.5	60	11
3.	Output, pounds of lime per day per sq. ft. of shaft area above cooler	355	900	17,152	587
4.	Output, pounds of lime per day per sq. ft. of average kiln cross-section, burning and storage zone	196	648	1,430	308
5.	Output, pounds of lime per cu. ft. per day of effective burning and storage zone space	7.5	27.0	25.6	10.8
6.	Output, pounds of lime per cu. ft. of burning zone space (straight shaft section)	12.3	40.6	40.5	27.8
7.	Output, pounds of lime per cu. ft. of total kiln space, cooler, burning zone and storage zone, if any, effective or ineffective	6.95	18.8	18.5	8.82
8.	Lime equivalent of lime and limestone in burning and storage zones, tons	64.2	30.0	152	61.8
9.	Lime equivalent of lime and limestone in entire kiln when full	69.0	43.0	193	74.5
10.	Time of travel of average lump of lime through kiln into the cooler	8.3	2.16	2.52	5.5
11.	Time of travel of average lump of lime from top of kiln through kiln and cooler	8.63	3.24	3.24	6.7

TABLE 3—RATE OF HEAT TRANSFER IN LIME KILNS

		A	*B*	*C*	*D*
1.	Kiln				
2.	Capacity	8	13.5	60	11
3.	Heating surface, sq. ft.	15,500	7,000	32,800	14,200
4.	Amount of heat absorbed per hour, all surface (millions B.t.u. per hour	1.43	2.41	10.73	1.960
5.	Heat absorbed per sq. ft. of heating surface per hour (B.t.u.)	95	345	280	138
6.	Assumed temperature difference between lime lime surface and gas passing through kiln	100	100	100	100
7.	B.t.u. absorbed per hour per sq. ft. per degree temperature difference	0.95	3.45	2.8	1.38

and the guess of 100 deg. is made merely to give some basis for calculation. Quite likely, though, it is fairly close. While it is impossible to imagine a heat transfer of less than one heat unit per square foot per hour per degree in temperature as indicated in kiln *A*, it may quite probably be that certain portions of the kiln are stagnant, with no gas at all or only a little gas flow, while other portions are working more normally. The next tabulation reveals some information that makes such a condition quite possible, if not certain.

TABLE 4—ACTIVE PART OF KILN CAPACITY

	Kiln	*A*	*B*	*C*	*D*
2.	Output, tons of lime per day	8	13.5	60	11
3.	Shaft cross-section, sq. ft.	45	30	70	37.5
4.	Storage space cross-section, sq. ft.	154	71	185	165
5.	Shaft free gas path (25% of cross-section)	12.5	7.5	17.5	9.36
6.	Storage free gas path (25% of cross-section)	38.4	17.8	46.2	41.2
7.	Volume of gas passing per second in burning zone at 1650 deg. F., cu. ft.	27.2	45.8	204	37.4
8.	Volume of gas passing in preheating zone at 1050 deg. F., cu. ft. per sec.	17.5	29.2	129	23.8
9.	Velocity ft. per sec. at 1650 deg. F. in shaft	2.18	6.1	11.6	4.0
10.	Velocity, ft. per sec. at 1050 deg. F. in storage zone	0.45	1.64	2.08	0.58
11.	Time in which gas passes through kilns, if uniformly distributed through entire cross-section, seconds, at average temperature of 1400 deg. F.	31	8½	12½	21

Before discussing the above, it would be well to remember that the higher the velocity of gas, the more rapid is the heat transfer rate. Roughly, the variation is about as follows for ordinary heating surfaces in a stream of hot air:

Velocity, ft. per sec	1	2	3	4	5	6	7	8	9	10
Heat transfer, B.t.u. per deg. F. per sq. ft. per hr.	2	2.7	3.4	3.9	4.9	4.8	5.3	5.7	6	6.3

In a lime kiln, temperature being higher and molecular activity greater, one would expect the heat transfer rate to be greater. This, however, may be only so when CO_2 is not exhuded from the surface, since such exhudation is bound to reduce heat transfer, in part by defeating the scrubbing effect of fresh velocity, and so the removal of the dead, cooled film.

Evidently the higher the velocity of the gas through the kiln, and the greater the surface, the more heat will be absorbed, but one just cannot have high velocity and also large surface except the kiln shaft is stretched out; that is, the kiln is of comparatively small shaft cross-section and rather high. Of the four kilns that we are considering, shaft velocity varies from 2.18 ft. per sec. to 11.6 ft. per sec. While the last is high, the first certainly is very low. With such low gas velocity, which means too large a shaft for the kiln cross-section, not only the heat transfer rate per square foot of surface is very poor, but the gas flow will not be uniform. It will select preferential channels of upflow that may be entirely different from preferential channels of rock downflow. This not only is likely to be so, but is so. Everybody knows of the great tendency for gas, to flow up one kiln corners and naturally the rock is most inclined to follow down the kiln center.

Importance of Proper Trimming of Kilns

Partly, the reason why gas will not flow uniformly, is because the drawing of the lime is not uniform, and so certain sections of kiln shaft are hot and others comparatively cool; and unfortunately the natural tendency of the gas is to pass up the hot channel instead of up the cool channel, where most of the heat is needed. This tendency will be the greater the lower velocity of the gas. Proper trimming of kilns, to the writer, appears even more important than proper firing, and when designing a kiln the greatest precautions should be taken to facilitate proper drawing and trimming.

Kiln *A* contains a large heat-absorbing surface, but due to the low velocity of gas, there is poor distribution, and so some surface in the kiln is not working, and therefore the output is poor. Under such conditions one may draw from such a kiln both overburned lime and lime containing core. Certainly the lime will have quite non-uniform characteristics. This especially was the experience with a kiln built in a certain plant that had a shaft 9x12 ft. Without thought one would say such a kiln would give a very large amount of lime, and while this was so, the output per square foot of shaft area was low and the lime burned very non-uniformly, containing much core, because it could not be drawn properly, and in addition to all of this the kiln life between repairs was less than two months. Channelling of the gas caused by improper kiln design and improper drawing of the kiln have a very great bearing on the kiln life. If burned lime remains up against a kiln wall, temperatures will get higher and higher, and eventually there will be fluxing and slag will begin to flow.

Shaft velocity of the gas is possibly dependent in part on the facility with which the gas enters the kiln, but mainly on the kiln draft. A kiln really is nothing but a chimney; with this difference, however, that the draft is used by the lime charge as fast as it is made. Now the higher the temperature difference inside and outside of the kiln and the higher the kiln, the better will be the draft and greater the possible gas velocity, and consequently the kiln capacity. A velocity of almost 11 ft. per sec. in kiln *C* is, however, possible only when the draft is produced mechanically. A velocity of about 7 ft. per sec. is, however, possible with natural draft, if the kiln is high enough. Kiln *B* has a velocity of 6.1 ft. per sec. with natural draft, which is very good when taking into consideration that its height above the eyes is only 30 ft. 7 in. This would not have been possible if the shaft would have been of a large cross-section. It also would not have been possible if the gas and air had not been delivered to the kiln under slight pressure, and so the kiln draft all made available for use in kiln.

While the velocity of the gas in *B* kiln is good for natural draft and therefore capacity high, from an efficiency standpoint, due to the kiln being so low, it is not so good. The gas passes through the kiln in 8½ sec., if passing uniformly distributed through the entire shaft and storage zone area. Since the gas flow even in this kiln will not be entirely uniform, some of the gas will pass through even more rapidly. In kiln *C* the gas passes in 12½ sec., which one would consider good.

When in the case of kiln *C* the induced draft apparatus was disconnected and the kiln operated on natural draft, the output dropped to only about half, or 30 tons per day. The kiln surface was the same, but the gas could not pass through the kiln. One may expect that under such conditions efficiency would greatly increase because the gas would remain longer in the kiln, would come in contact with more surface to give up its heat to, and the lime would pass slower through the kiln. But the difference in efficiency was the other way; that is, lower rather than higher, for several reasons: One was that the various losses such as the radiation loss, for example, increased as capacity was reduced; then stratification became greater, and only part of the kiln shaft was working at an efficient rate. A greater reason is that at a certain height a certain amount of heat will be absorbed, and to make the kiln any higher does no good whatsoever so far as efficiency is concerned. while the height of kiln *C* for 50 tons per day may have been right, the kiln was higher than it need have been for only 25 tons per day. On the other hand, kiln *B* is entirely too low for its high capacity; the lime passes through this kiln so fast that every morning the storage zone is empty and the top of the charge is red hot. There is a very definite relationship between kiln height and kiln output; and beyond a certain point the reason for height increase can only be capacity increase.

The question arises whether it is proper to have the upper, that is, the storage zone

of the kiln, of larger cross-section than the burning zone proper. One may think that this would give more surface, and if such surface is active it would be desirable; but is it active; can it be any more active than the burning zone, if of equal cross-section? Taking kiln *C* as an example, is it reasonable to expect that the gas leaving the burning zone at velocity of 11 ft. per sec. would immediately distribute itself over large storage zone at a velocity of 3 ft. per sec.? Certainly not. Did any one ever see a kiln top with smoke coming out equally all over it? No, because the gas passes up a certain way and this way may not be that which the stone follows downward. The reason for this is that the gas, due to the laws governing gas flow, will follow the path where the stone is the hotest; that is, it will follow the path where the stone was in the storage zone the longest, and that is not the storage zone center through which the rock passes with the greatest rapidity, but rather the storage-zone sides. This situation in a kiln can be so serious that recirculation occurs; air from the outside will sink down into the storage zone often for considerable distances, even to 15 ft. This downward flow will be where the stone is the coldest, or where the wind has the greatest effect. Consequently there is bound to be considerable delay in heating the stone and considerable loss in efficiency and capacity. The thing to do in such a case is to force the gas through the cold stone, but the only simple way to do this is to have the storage zone small in diameter. According to all arguments, excepting only that about the stone storage, the storage zone really ought to be of a diameter smaller than the burning zone, because as in a blast furnace the aim is to maintain the gas at a constantly high velocity. Instead of this, the velocity is reduced often to only a fifth of that in the shaft proper.

If the straight part of the shaft is high enough so all the preheating is done in the narrow portion, then above that the storage zone may be of any size practicable, or such a storage zone may be entirely separate of the kiln. In this respect the Mount kiln is certainly correct, the storage zone is entirely inactive, the gas being drawn from the kiln below it, and these kilns give as low (and lower) terminal gas temperatures as kilns having tremendous storage zones. A certain kiln of this type having a shaft area of only 30 sq. ft., straight 37 ft., high had an output of 20 tons of dolomitic lime per day. This would indicate the following: Active kiln space 1100 cu. ft; active heating surface 3850 sq. ft.; pounds of lime per day per square foot of shaft area 1330; pounds of lime per cubic foot of active kiln space 36.4; time of travel of lime through active space of kiln 1.54 days; heat absorbed per square foot of heating surface per hour 162 B.t.u. This appears to be much better than the performance of the previously described kilns *B* and *C*, and while it is very good, this partly is so because the stone burned was 43% $MgCO_3$ and only 55% $CaCO_3$. With such stone both less heat is necessary per pound of product, and less coal need be burned.

Influences Which Affect Rate of Heat Absorption

The amount of heat that may be absorbed by lime from hot gas in a given time depends upon the rate of heat transfer, which is mainly a factor of velocity, of temperature difference and of surface. Tabulating the possible influences we conclude:

(1) *Heat transfer varies about as the square root of gas velocity.*

(2) *The smaller the stone the greater will be the surface for a fixed volume of charge.*

(3) *The smaller the stone the smaller the gas paths and the more intimate will be the contact of gas with surface. Since gas friction varies as the square root of velocity, there is a practical limit below which it is inadvisable to reduce the stone size.*

(4) *The more equal the gas flow distribution over the kiln cross-section, the greater will be the actually working surface.*

(5) *The higher the gas temperature the better burning, of course, but too high temperatures cause practical difficulties.*

(6) *The greater the conductivity of stone and of lime the faster will the heat be carried under the surface and the higher will be the surface gas temperature difference.*

(7) *Gas of radiant characteristics will be the better heating medium because heat transfer by radiation is not dependent upon velocity. It increases very rapidly as temperature increases and is entirely independent of heat transfer by convection, which can proceed simultaneously at the normal rate dependent upon velocity and temperature difference. Radiant heat transfer is not obstructed by the CO_2 gas exhuding from the surface, while this exhudation is bound to reduce convection heat transfer.*

(8) *When high calcium stone is burned most of the heat, or about two-thirds, will be absorbed when the surface temperature is at or about 1650 deg. F. When the stone is of dolomitic nature, the dolomite will break down and the magnesium carbonate will calcine at a temperature 260 deg. F. lower, or about 1390 deg. F. In consequence of this, the temperature difference between surface and gas will be greater and the amount of heat transferred greater, if the gas temperature is the same as in the case of high calcium stone.*

(9) *Since magnesium carbonate requires less heat per pound of calcined product, when dolomitic stone is burned, less heat will have to be absorbed by the surface. If the amount of heat for high calcium limestone required is 2136 B.t.u., for dolomitic limestone of 40% $MgCO_3$, the amount will be only 1950 B.t.u.*

(10) *Combining the fact that with dolomitic limestone in a 40% $MgCO_3$ and 60% $CaCO_3$ ratio, the heat to be transferred will be 7.6% less, with the fact that the magnesium carbonate is being burned with the heat not usable for burning or calcium carbonate, it appears that higher capacity can be obtained with such kilns with an equal amount of coal. Since kiln capacity is more a factor of how much coal can be burned and gas passed through the kiln, so with stone containing considerable amounts of magnesium, capacities much higher become possible, higher almost to the extent of 40%.*

Gas Firing the Most Efficient

One's reasoning is greatly facilitated if the burning and preheating zones are considered separately. According to the amount of heat absorbed in the two, the burning zone would need be twice as great as the preheating zone, because twice the heat has to be transferred here. Since, however, the burning combustible in the gas will tend to keep the gas hot while the decomposing lime will tend to keep the charge cool, temperature differences encountered in a normally working kiln will be greater in the burning than in preheating zone where the problem is merely the exchange of sensible heat from one to the other under the plain convection principle.

To a great extent the amount of heat that will be absorbed in the burning zone in actual lime making is determined outside of the kiln. Only heat higher than about 1600 deg. F. will make lime, and if any heat is lost from the gas before it enters the kiln by radiation, or if the heat is wasted in heating idle gases such as excess air or steam, there will be less heat available for lime burning.

Then, also, if lime is not made in the burning zone, stone in the preheating zone will get heated up to the temperature of the gas and will be unable to absorb further amounts of heat.

From this it appears that the better the gas supplied to the kiln, the hotter it is, the less steam it contains, and the less excess air used for its proper complete burning, the more lime will be made in the burning zone. Under these conditions the average temperature in the burning zone will be greater, as will also the temperature difference between surface and gas; heat transfer, therefore, will be greater even though the gas weight will be less. Due to favorable conditions, more heat will be transferred per unit of surface in a given time, so in an efficient kiln, even the more lime obtained, the burning zone will need be no greater.

This is not the case with the preheating zone. The more efficient the burning zone the less heat will be in the gas from a pound of coal when entering the preheating zone.

The capacity of kilns will vary, also, with the method of firing. With gas firing it will be greater because gas is supplied from flues under slight pressure. With direct firing the kiln draft has to be used to burn the coal, so less is available for the movement of gas through the kiln. While a draft

gage may not show any draft in the kiln still it is the draft that makes the kiln work. Only under the best conditions is it used up in gas friction as fast as it is generated. Not as high capacity can be expected from a given size kiln with direct as with gas firing.

The following tabulation shows approximately what capacities may be expected from gas-fired kilns of various sizes, with natural and induced draft and high calcium limestone:

Kiln shaft size	Shell diameter, ft.	Capacity, natural draft, tons per day	Capacity, induced draft, tons per day
4½x7½	12	10-12	15-20
5 x10	14	18-22	25-35
6 x12	16	30-35	40-60

With dolomitic stone the output should be greater. From this tabulation one can deduct that there is no reason why kilns should have a larger shaft than 6x12. The output possible is as great as one could desire, and considering that with the larger shafts the control becomes difficult, and lime unequally burned, then it is best for one to confine himself to this or smaller shafts, depending on the output desired.

Dimensions of Kiln Parts

The cooler should be large enough to hold at least one-third to preferably one-half of the daily output. The cooler height should be no less than 12 ft., and 15 ft. is better. With such a cooler some air can be allowed to pass through it. This air will become preheated and the lime cooled. With shallow coolers, if an attempt is made to force the kiln, gas will be forced downward, and there arises a possibility of recarbonating the partly cooled lime. If the kiln is forced still more, the entire cooler will become red hot and the lime cooled but little before drawing. Considerable heat would thus become wasted.

The shaft height above the cooler and below the storage zone should be sufficient to both burn and preheat the stone. One should not depend upon the storage zone for preheating, because this zone as previously explained is inefficient for that purpose. The exact height of the shaft will depend upon whether the kiln is operated with natural or with induced draft. It is not so much height that we want, but the proper amount of surface per pound of lime made. For natural draft and low capacity, the shaft height should be 25 to 30 ft. The last gives sufficient surface to both preheat and burn the lime with 100 deg. F. temperature difference, and 3½ B.t.u. heat transfer per square foot per hour, per degree difference in temperature.

A mechanically-induced-draft kiln will have a higher gas velocity, and so also a higher heat transfer rate. For this reason the shaft height need not be increased in proportion to capacity increase. A height 35 to 40 ft. is ample. A height of 40 ft. would give sufficient surface for a transfer rate of 4½ B.t.u. per square foot per hour, per day.

With this height the shape and size of the storage zone, as far as capacity and efficiency is concerned, is of little importance, because its purpose will be purely that of storage. The desirable capacity is two days' supply, which is ample for the natural draft kilns; but to store this amount on a 60-ton kiln having a storage zone 14 ft. net in diameter would require a clear height of over 30 ft., which would make the kiln from ground up 95 ft. high. Due to this, it is necessary to provide rock storage in such a way that the kilns can be charged with convenience at any time desired. With such an arrangement kiln heights can be considerably reduced.

The following tabulations present the variables of capacity, velocity, heat transfer, etc., of the three kilns of different sizes, when operated with either natural or forced draft:

TABLE V—CAPACITY OF KILN OF VARIOUS SIZED CROSS-SECTIONS

Kiln shaft size, ft.	4½x7½	5x10	6x12
Shell diameter, ft.	12	14	16
Output, natural draft tons per day	10-12	18-22	30-35
Output, induced draft tons per day	15-20	25-35	40-60
Lime per foot, shaft height, lb.	1900	2800	4030
Lime in 30 ft. of height, tons	28½	42	60
Lime travel through shaft at high capacity, days	2.24	1.96	1.68
Lime travel through shaft at low capacity, days	2.88	2.13	1.9
Lime in 40 ft. of height, tons	38.1	56	80
Gas volume at low capacity per sec. at 1650 deg. F.	37.5	68	109
Gas volume at high capacity per sec. at 1650 deg. F.	58	102	170
Gas passage area in shaft, sq. ft.	8.44	12.5	17.7
Velocity of gas with natural draft, ft. per sec., at 1650 deg. F.	4.45	6.0	6.8
Velocity of gas with induced draft, ft. per sec. at 1650 deg. F.	6.86	8.2	9.6
Heating surface in shaft of 30 ft.	7000	10,500	15,200
Heating surface in shaft of 40 ft.	9400	14,000	21,000
B.t.u. to be transferred per hour, low capacity (millions)	1.90	3.50	5.6
B.t.u. to be transferred per hour, high capacity (millions)	3.0	5.3	8.9
B.t.u. per sq. ft. per hour, low capacity	275	334	369
B.t.u. per sq. ft. per hour, high capacity	314	380	425
B.t.u. per sq. ft. per hour per deg., low capacity	2.75	3.34	3.69
B.t.u. per sq. ft. per hour per deg., high capacity, 200 deg. F. temperature difference	3.14	3.8	4.25

APPROXIMATE KILN HEIGHTS FOR HIGH CAPACITY AND ONE DAY STORAGE

Output	15-20	25-35	40-60
Shaft dimension	4½x7½	5x10	6x12
Height below cooler	5	5	5
Cooler height	13	14	15
Shaft height	40	40	40
Storage zone height	9	11	13
Neck and waste space	5	5	5
Total height	72	75	78

The height of low capacity kilns above drawing floor, with two days' storage, will be about 12 ft. less.

From all of this it becomes apparent that kilns for best results should be built higher than customary; it also appears that they should be operated with induced draft, with the aim of getting high capacity. Small capacity kilns, if properly built, are too expensive; and construction costs per ton are greatly lowered when larger kilns are built. Plants producing large amounts of lime should favor induced-draft, gas-fired kilns of 6x12-ft. shaft size and 60-ton daily capacity. With smaller demands for lime and desire for flexibility 30-ton kilns of 5x10-ft. size are about right. Smaller capacities than this should be avoided whenever possible, since investment as well as operating cost increase; fuel efficiency is reduced, and the quality of the lime becomes impaired in most cases of low output.

(To be continued.)

Instructions in Theory of Water-Cement Ratio Given Builders

A COURSE of instruction for contractors, superintendents of construction and architects interested in the theory of "water-cement ratio," conducted by two representatives of the Portland Cement Association, under the auspices of the Illinois Society of Engineers, was recently given at the plant of the Rock Island Sand and Gravel Co., Rock Island, Ill.

A class of 23, one group of 16 and an alternate of seven receive nightly instruction in the proper proportioning of water and cement to be used in mixing concrete of various strength and consistency using local materials. Tests are conducted demonstrating the results of the various mixtures.

The "slump" test is being explained very fully for the benefit of the class and the building trade is very interested in the subject matter of the instructions.

Those attending these instructions will have a much clearer conception of concrete specifications in the future, a better working knowledge of proper proportioning of water, cement and the aggregate which they may have at hand.

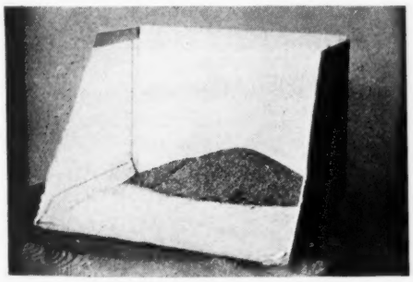
Rough Estimation of Tonnage of Stone and Gravel Storage

Short Methods Which Give Results Accurate Enough for Many Purposes

By Edmund Shaw
Contributing Editor, Los Angeles, Calif.

THE ESTIMATION of quantities of material contained in piles of irregular shape (or removed from excavations with the bottom at different levels) cannot be made satisfactorily by approximate methods. Rough guesses made by pacing and estimating heights and depths by the eye may come close to the true result, or they may be so much in error as to be worthless. Some sort of a survey must be made to be sure of a result that will not be seriously misleading.

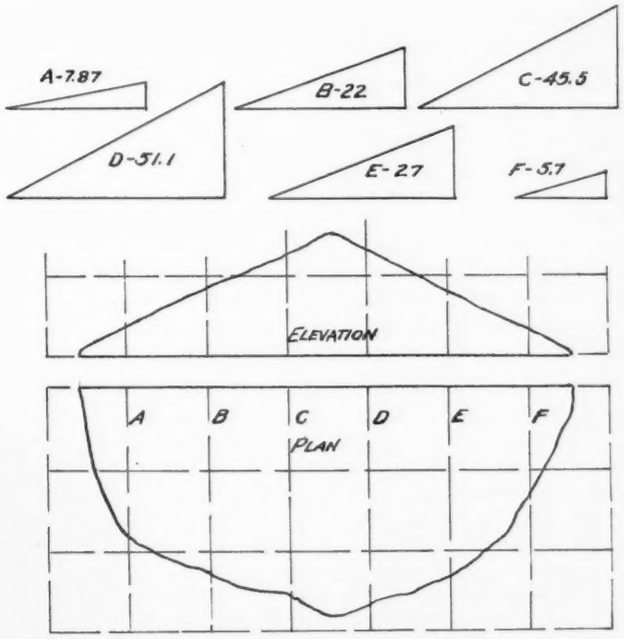
Before deciding to make this statement it was thought best to investigate the subject experimentally. The method chosen was to pour sand from a carefully measured container to form a pile on the bottom of a pasteboard box. The box was tested to make sure that the sides were at right angles and it was lined with squared paper to make



Box with accurate sides and lined with squarel paper

measurements of elevation and distance easy.

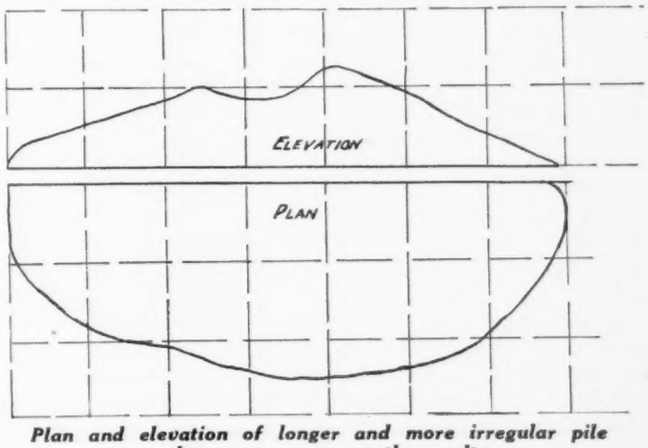
The objection to this method is that the volume of the sand in the container and in the pile may not be the same because the sand might pack tighter in one than the other. This was found to be the case, and in the first tests the calculated volume was only 83% to 85% of the volume in the container. Each time the sand was poured back from the pile into the container it overflowed about 10%. The container was tall and narrow, so it was evident that the sand would not pack in it as tightly as it did in the pile without being rodded or settled in some way. So the container was filled in layers and each layer was settled by tapping the bottom of the container on the table. After this the sand would go back into the container without overflowing, settling each layer by tapping as the container was filled at first. The calculated volume and the volume of the container then checked fairly well.



Plan and elevation of squares and sections figured with area of each section shown

By making careful measurements checks were obtained within 2½%. Most of the determinations made by actual measuring ran between 94% and 95%. One result was only 89.1% correct, although the measurements appeared to be taken as closely as in the other tests. The pile was cut by section lines and the area at each section figured, and one reason why closer results were not obtained was that not enough sections were taken. But this was purposely done, as the idea was to show what could be expected of methods that were only approximately correct.

With piles of a regular shape as good results were obtained by considering the pile to be a regular solid and calculating its contents as in any other way. Thus in the case of a conical pile with a somewhat irregular base a 94% result was obtained by considering the pile to be a cone with a radius equal to the average distance from the center to the periphery of the base. Using the other method, that of taking sections, a 97% result was obtained. But when a longer and more irregular pile was figured by averaging lengths, widths and heights, the result was 121% of the true contents, and this would be a serious matter is one were buying the pile on the basis of its yardage. It was from such results as these that it was judged that the ordinary rough determination would be too rough for practical pur-



Plan and elevation of longer and more irregular pile where an overrun was the result

poses and that some sort of a survey, even though it was only a rough survey, should always be made.

Incidentally, the two methods of calculating the contents of earthwork were investigated, the average areas method and the use of the prismoidal formula. The latter gave the better results for the number of sections taken, which is what would be supposed as the accuracy of the average areas method increases as the number of sections taken increases, for piles of irregular shape. In the conical pile shown in the illustration the difference was 3½%, a 94% result being obtained by the average area method and a 97.5% result by the prismoidal formula.

Weights and Volumes of Broken Material

The difficulty mentioned, that of getting the sand to pack in the container and the pile to the same degree, is just one example of the difficulty always found in ascribing a weight per cubic foot to broken or pulverized material. There are tables in engineers' handbooks and textbooks which give the weight per cubic foot of various rocks blasted and piled and in stock piles and bins; but in the writer's opinion they are only very rough averages, or else they assume a uniform grading which is not often found in practice. Marks, in his handbook, for example, gives the following weights per cubic foot for rock "blasted and piled":

Sandstone	82 lb.
(Gypsum)	91 lb.
Limestone, quartz, etc.	95 lb.
Granite	96 lb.
Trap (heavy)	107 lb.

The weight of gypsum is not in the original, but it has been figured on the same basis as the others, taking the specific gravity from the same tables. It is evident from the specific gravities given that these weights assume 42.4% voids in the blasted and piled rock. This high percentage of voids might be found where stone of the same size had been selected and piled, as it would be in selecting an evenly sized feed for a lime kiln, for example, but rock that lies as it is blasted down, fine and coarse together, has a much greater weight per cubic foot. Just how much the stone will be compacted depends on the way it breaks in blasting, the distance it is thrown from the face, the depth of the pile, and so on. Sometimes a blast will disturb the appearance of the face very little and yet break the rock sufficiently so that it can easily be loaded with a steam shovel. This has been noted in quarries in the Columbus and Delaware formation in Ohio, in which the rock lies in fairly thin and very regular strata.

An old rule used by miners, which was based on the experience of removing broken ore from measured stopes and chambers, is that "rock swells one-third in blasting." This would make the weight per cubic foot about 109 lb. for ordinary limestone and quartz. For dolomite and granite it would be 116 lb., and for the heaviest traps (sp. gr. 3.1), 130 lb. These weights seem high, but they would probably be close to the weights one would find where there is a good deal of fines and clay to fill the voids.

Taggert, in his handbook, in a footnote, says that rock in dumps and piles will occupy 1.6 to 1.9 times its original volume. Assuming that the lowest figure is the volume in piles such as are left after blasting, where there is a mixture of fine and coarse, the following table has been calculated to show what the weights may be under average conditions:

Rock	Sp. gr.	Wt. per cu. ft.	Cu. ft. per ton
Sandstone	2.35	92 lb.	21.75
Gypsum	2.52	99 lb.	20.02
Ordinary limestone, quartz, etc.	2.60	101 lb.	19.75
Dolomite and granite	2.80	109 lb.	18.35
Heavy trap	3.01	121 lb.	16.50

The weight of unwashed sand and gravel does not have to be figured very often, as the material goes at once from the deposit to the plant, in most cases. But for such material it would probably be close enough to use a weight of 100 lb. per cu. ft., and this would also serve for the weight of stripping. Difficult tables which have been consulted to verify this give weights running from 95 to 110 lb. for such material with the average around 100 lb.

Weights of Prepared Material in Bins and Piles

For rock crushed to the regular commercial sizes and for washed and screened gravel we now have abundant information as to the weight per cubic foot. This is due to the recent work of the laboratories of the National Crushed Stone Association and the National Sand and Gravel Association in determining the relation between the percentage of voids and grading in these materials. A table showing the weights per cubic foot of crushed limestone from ⅛-in. to 2¼-in., combined in various gradings, is given on page 74 of the February 2 issue of Rock Products. This shows the dry and loose weights to vary from 91 lb. to 106.75 lb., and the dry and rodded weights to vary from 99 lb. to 113.3 lb. Presumably the dry and rodded weights represent more nearly what one would find in a stockpile or bin, especially where the material was dropped some distance. The limestone chosen for determining these weights was rather heavy, the specific gravity (2.75) being almost that of dolomite. For limestones with a specific gravity of 2.60 the dry and rodded weights would be 94 lb. and 107 lb. Of course the weights of other stones with the gradings given in the table may be figured from the specific gravities.

According to the report of the National Sand and Gravel Association's research laboratory, the weight of gravel varies according to the grading, from 93.3 lb. to 106.8 lb. for the dry and loose state, and from 99.7 lb. to 113.3 lb. for the dry and rodded state. These are about the same as the weights given above for crushed stone, but a direct comparison of this kind is very misleading. The specific gravity of the gravel tested was 2.55, which is low for a silicious gravel. If the specific gravity had been 2.65, as it often is, the weights would have been approximately 103 lb. and 117 lb. for the dry and rodded state. And if the gravel had come from rocks as heavy as the limestone tested, the dry and rodded weights would have been 108 lb. and 122.5 lb., gravel always having a greater weight per cubic foot for the same specific gravity and grading, owing to the shape of the pieces, which allows them to pack with less voids.

The writer has several times found the weights of silicious gravels to be close to 100 lb. per cubic foot, but this weight was found by shoveling the material into a cubic-foot box without rodding. It is evident from the above that such a method is too rough and that the grading should always be taken into account.

Weights of sand vary more than weights of gravel, for bulking as well as specific gravity affects them. The lightest sand, the writer remembers weighing, ran 92 lb. to the cubic foot. It was a fine sand and dry. The heaviest weighed 124 lb. to the cubic foot, but this was hardly to be compared with ordinary sand, as it was made over a ½-in. screen and had a large number of grains from ⅜-in. to ¼-in. Presumably these were combined with fine sand with very little medium-sized grains present, although this was not determined at the time. Sands from the rivers of the Middle West usually run around 100 lb. to the cubic foot, unless they are so damp as to bulk considerably. The sand-gravel that is now produced in considerable quantity for concrete aggregate and for surfacing highways in several trans-Mississippi states has 28% voids, dry and rodded, which would give it a weight of 122 lb. per cu. ft. for silicious grains.

Bulking from dampness has always to be taken into account with sand and even with fine gravels. The matter has been thoroughly investigated and the results have often been published both in Rock Products and in the United States Bureau of Public Roads publications. So it is unnecessary to go into it here any further than to say that as bulking may affect the volume as much as 30% in extreme cases, the error from neglecting it may be much greater than ordinary errors arising from faulty measurements or from considering the weight per cubic foot to be an average of many weights.

A weight that must be taken into consideration in designing bins for sand is that of saturated sand. This may weigh as much as 175 lb. per cubic foot (sand and water together); and as saturated sand has the properties of a liquid, the bursting effect is that of a liquid about three times as heavy

as water. Bins and tanks have burst because the designers did not take this great hydrostatic bursting pressure into account.

Tonnage of Material Passing Through a Plant

The tonnage of material in a pile or a deposit is the product of the cubical contents times the weight per unit. The tonnage of material flowing through a plant is the product of the weight passing in a unit of time times the total time. The methods of finding it and the difficulties of getting a satisfactory result are of a different nature from those described.

The total feed to the plant is usually determined easily by counting the number of cars dumped or dragline buckets emptied, or similar units. More accurate results are obtained in larger plants by weighing devices on conveyors that carry the feed. As the weights are finally checked by the weight of material produced, less loss by dusting or removed by washing, the results are satisfactory except for special purposes. And one of these is when the loss in dust or that removed by washing has to be determined.

Moisture becomes very important where accurate determinations of this kind have to be made, as some mineral substances will hold a surprising amount of moisture that does not show on the surface. Phosphate rock from the Tennessee field may carry as much as 14% of moisture while the surface of the pieces appears to be dry. Some porous limestones will hold considerable moisture without showing it. Sand and gravel freshly taken from deposits above the water may carry 8% or 10% of moisture, or dry banks may carry so little that the sand will run. Taken from underwater deposits, the material may carry 20% moisture, unless it has a chance to drain. So if a plant is being checked some care has to be taken to make sure that some of the tonnage charged as feed is not water, and it is equally important to know the moisture in the outgoing materials.

Where the tonnage flowing to a single machine has to be estimated, timing methods have to be used. If the machine is preceded by a feeder, and the space available will permit, the flow from the feeder may be shunted into a box by means of a short spout. Then the weight for a number of strokes of the feeder may be obtained and divided by the number of strokes taken to secure an average weight per stroke. If the feed is from a continuous stream, as from a spout or a conveyor, it is possible theoretically to shunt the feed into a box for five seconds or other short time taken by a stop watch. This is the method generally used with wet pulp.

The difficulty the writer has always met when he attempted to take dry tonnage samples of this kind is that there is no room to put in a spout or even to hold a box to catch the sample. The machine and the feeding device are usually set too close together to permit of this being done. For these conditions the velocity has to be measured. In the case of a stream of material moving slowly in a chute or on a conveyor it is possible to measure the width and depth with sufficient accuracy and to find the velocity by observing how long it takes a piece to travel a measured distance. By measuring down from a stick placed over a conveyor a fairly accurate cross section of the material traveling on a belt may be made, which can be multiplied by the belt travel. The results of a number of such determinations should give a dependable average.

The hardest estimation to make is that of the feed to a machine where the flow is very irregular. One sometimes sees a secondary crusher fed so heavily as to be crowded for a few minutes, after which there will come a period of slow feeding, so that the crusher may actually be running empty for a while. In such case it is better to measure the flow from the crusher rather than the feed, for it is steadier. By noting the length of times that the crusher is overfed and underfed, and watching the operation long enough to be sure that one gets an average of such times, a result that may not be accurate, but one that will be considerably better than a guess, may be obtained.

Estimations of tonnage in washing plants and of water flow will be treated in a subsequent article.

Dredging Sand and Gravel in England

THE PAPER of Ronald Stanley Brewis, "Dredging Sand and Gravel by Centrifugal Pump from a Commercial Standpoint," was awarded the Maybury silver medal and a fellowship when it was delivered before the British Institute of Quarrying in 1928. It is reprinted in the *Quarry Managers Journal*. There is nothing revolutionary in the paper nor even anything particular novel, but it is one of the best presentations of the theoretical principles involved in sand and gravel dredging, with a conservative statement of its possibilities and cost of operation, that has been published.

To the American producer, the statements in the paper regarding costs will be of the greatest interest. Mr. Brewis gives these for what he appears to consider the ordinary British plant, which is of rather small tonnage from the American point of view, 1000 cu. yd. per week. To quote from the paper: "*The cost of pumping* depends on:

1. How far the foregoing conditions approach perfection.
2. Size of pump.
3. Length of pipe line, etc.

Under average conditions and using a pump capable of maintaining a flow of 10 ft. per second through 300 ft. of 6-in. internal diameter steel pipes (the smallest pump usually practicable) driven by a 50-hp. petrol-paraffin engine and delivering the spoil to a height of 12 ft. above water level, the costs have been found to be roughly as follows:

Weekly:		
Wages, one man and boy	£ 6	($29.10)
Fuel and oil	5	(24.22)
Wear and tear of pump, engine and pipe-line	12	(58.25)
Depreciation on £1500 at 10% per annum	3	(14.55)
	£26	($126.12)

"Pumping free running spoil through about 300 ft. of pipe, the output would average approximately 20 cu. yd. per hour, and the weekly output would be in the region of 1000 cu. yd., so that the cost per cubic yard would be approximately 6d. (exclusive of indirect overhead charges).

"The capital outlay to produce this output would probably be as follows:

6-in. gravel pump	£ 250	($1230)
60-hp. petrol engine and 5-hp. auxiliary engine	450	(2195)
	100	(486)
Pontoon	350	(1700)
Pipes, bends, flushing pumps, fitting, etc.	350	(1700)
	£1500	($7301)

The cost figures out to 12.6 per cu. yd., which seems high for pumping only, and with a lift of only 12 ft. But it will be noted that half the cost is for wear and tear, which would indicate that the service is very severe. Taking the figures at 8 c. a ton and including only the items of cost given in the table, the cost for a lift of 12 ft. should not be more than half the above amount. Cost for pumping only and including all the items in the table, have been brought to the neighborhood of 1 c. a ton on some of the Middle Western rivers, using Diesel-engine dredges. It must be remembered that it is the cost of administration, superintendence, washing and separating car loading, royalties and taxes that makes the cost of the product on the car so much more than this.

Comparison of the items of capital outlay with prices with which producers are familiar shows that the main items, the pump and the engine, cost about the same or perhaps a little more than here. Still it would be hard to build an efficient dredge, even a 6-in. dredge, in this country for $7300.

Mr. Brewis says in his paper that such an outfit is too small for economical operation and he advises the use of larger pumps, at least 8-in. and better still 10-in. to reduce costs. With the 10-in. pump he figures that the output could be raised to 70 cu. yd. per hour, and that the wear and tear could be cut in half and the other items lessened.

One criticism that might be offered is that nowhere in the paper is the advantage of using cutters mentioned. These are now considered essential in the United States except in one or two favored localities where sand running in the bed of the river gives the pump all the solids it can handle without them. It is admitted that this view of cutters is new in this country, for it is only in the last two or three years that they have been considered necessary in all cases.

Effect of Aging on the Grinding Resistance and Cementing Value of Portland Cement Clinker

By L. N. Bryant
Chief Chemist, Basic Products Co., Kenova, W. Va.

AMONG the old school of portland cement manufacturers it was generally agreed that aging of the clinker was an essential procedure in the process of manufacture; which was undeniably true at that time, due to the rather crude methods of grinding and handling of the ground raw materials, resulting in much unsound and underburned clinker. An aging of from one to three months and more was not uncommon.

With the advent of more modern machinery for grinding, more efficient blending and therefore more accurate chemical control, cement clinker of more uniform quality is being manufactured, practically eliminating aging as a cure for unsoundness. Most cement mills have an adequate clinker storage to insure flexibility in operation. Some of these storages or bins are covered, some are not. A well-covered storage will allow little access of moisture other than the usual moisture contained in the atmosphere, preventing a rapid aging. An uncovered storage subjects the clinker to the full action of the weather, allowing all dew, rain, snow, etc., to attack the clinker, causing a very rapid aging.

The aging of unsound clinker or cement is an essential factor in the process; but another and unfavorable factor enters into the effect of aging the clinker, namely, the increase of the grinding resistance above that of the fresh clinker. The old opinion that well aged but dry clinker was less difficult to grind than fresh, cool clinker was without foundation, and has been discredited several years; but that opinion is yet maintained by many in the cement industry.

To obtain information as to the relative grinding resistance of aged and fresh clinker, a series of experiments were attempted by the writer, using the 200-mesh fineness of the ground clinker as a measure of the grinding accomplished, and the percentage of loss on ignition as a measure of the extent of aging, the results of which are given below:

Experiment No. 1

To determine the effect of aging on the grinding resistance of clinker of a given composition

A large sample of hot, well-burned clinker was taken all at one time from a kiln in order to have a clinker, all of which would have the same chemical composition, degree of burning, etc., as nearly as possible. This clinker had the following chemical analysis:

	Per cent
Silica	22.70
Alumina	6.75
Ferric oxide	2.01
Calcium oxide	67.54
Magnesium oxide	0.72
Sulphur trioxide	0.05
Loss on ignition	0.00
Free lime (White's method)	Trace

This clinker was screened and a large sample taken from that material passing an 8-mesh screen and retained on a 10-mesh screen. This sized material gave a clinker of as nearly one size as was practically possible to obtain. After taking the initial fresh sample, the remainder was placed in the open, exposed to the weather.

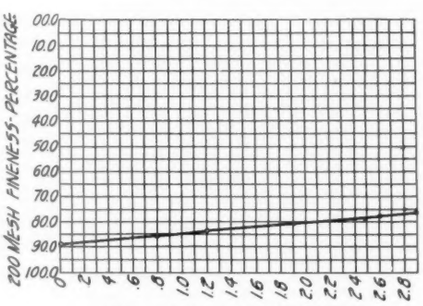


Diagram showing effect of loss on ignition on grinding resistance

Exactly 5 lb. of the sample were placed in the laboratory tube mill containing 60 lb. of worn concavex steel balls, which averaged 1 in. in diameter, and ground for exactly 30 minutes at a speed of 32 r.p.m. Beginning with the fresh cool clinker, and at intervals up to 10 months, this procedure was followed throughout. (Exception being made to the drying of the aged clinker to remove the mechanically held moisture before grinding.) All grinds were made in duplicate and the average 200-mesh fineness and loss on ignition were taken as the results of the interval test.

The results of this series of tests were tabulated as follows:

Grind No.	Age	Per cent passing 200-mesh	Per cent loss on ignition
1	fresh	89.22	0.00
2	1 month	86.00	0.79
3	2 months	84.00	1.22
4	3 months	81.21	1.88
5	6 months	78.50	2.60
6	10 months	77.22	2.93

The accompanying graph was constructed to more clearly present the effect of the loss on ignition on the grinding resistance, making use of the percentages passing the 200-mesh screen and the percentages of loss on ignition.

A continuation of the intersecting line to the point of zero 200-mesh fineness would indicate a possible loss on ignition of 22.5%. Theoretically, with this maximum of loss on ignition, when subjecting the clinker to the identical conditions of grinding as followed in these tests, no grinding would be accomplished. The straight line of the graphical illustration would indicate an inverse proportion of loss on ignition to the fineness to be obtained. By using the maximum figure for the loss on ignition and the maximum 200-mesh fineness obtained on the fresh clinker, the relative grinding resistance factor was readily computed. Viz.:

$$\frac{89.22\% \text{ of 200-mesh fineness}}{22.5 \text{ loss on ignition}} = 3.96 \text{ R.G.R.F.}$$

Therefore for each per cent of loss on ignition, a corresponding decrease of 3.96%, 200-mesh fineness would be obtained.

CONCLUSIONS: That with a given composition, degree of burning, etc., of portland cement clinker, the grinding resistance varies in direct proportion to the loss on ignition.

That with a given composition, degree of burning, etc., of portland cement clinker a relative grinding resistance factor may be computed.

REMARKS: The relative grinding factor will no doubt vary at different mills manufacturing a different type clinker, but where uniformity of product is maintained, and when the clinker is to be aged or stored in the open, such a factor will be of value.

Experiment No. 2

To determine the effect of aging on the grinding resistance of clinkers of different chemical composition

Two separate runs of clinker were made, using slurries of the same degree of fineness, burning to the same degree as nearly as practice would permit, but varying as to chemical composition. These separate runs of clinker had the following chemical analysis:

	Clinker No. 1, per cent	Clinker No. 2, per cent
Silica	22.82	23.15
Alumina	6.52	6.95
Ferric oxide	2.16	2.22
Calcium oxide	67.41	66.50
Magnesium oxide	0.70	0.76
Sulphur trioxide	0.03	0.02
Loss on ignition	0.00	0.00
Free lime (White test)	Trace	None

Large samples were taken and subjected to the same procedure as used in Experiment No. 1, aging up to a period of six months in the open, exposed to the weather. The results of this series were tabulated as follows:

CLINKER No. 1

Grind No.	Age	200-mesh fineness, per cent	Loss on ignition, per cent
1	fresh	87.00	0.00
2	1 month	84.00	0.76
3	3 months	82.00	1.24
4	6 months	78.11	2.12

CLINKER No. 2

Grind No.	Age	200-mesh fineness, per cent	Loss on ignition, per cent
1	fresh	85.01	0.00
2	1 month	84.60	0.40
3	3 months	84.22	0.76
4	6 months	82.00	1.56

The accompanying graph was constructed to more clearly emphasize the effect of the loss on ignition on the grinding resistance of clinkers of different chemical composition.

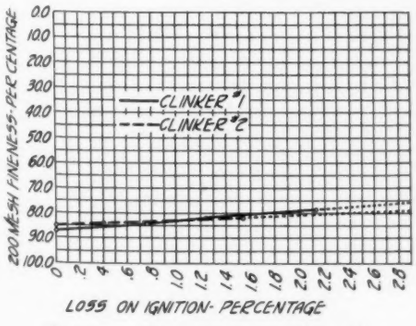


Diagram illustrating results of Experiment No. 2

CONCLUSIONS: That a higher limed clinker will have a lower grinding resistance when fresh and cool than one which is lower limed, provided other conditions be equal.

That the grinding resistance of a higher limed clinker increases to a greater degree than that of a lower limed clinker when both are subjected to the same conditions of aging.

That when the clinker is to be stored in the open for an extended period of time, a lower grinding resistance of the aged clinker will be obtained by manufacturing a lower limed clinker than is customary.

REMARKS: The above results are in strict disagreement with the theory that aging of portland cement clinker produces a product which is less difficult to grind.

Experiment No. 3

To determine the effect of aging on the cementing value of portland cement clinker

Samples of the ground clinker from Experiment No. 2 were used in this series, consisting of the Nos. 1 and 4 grinds from clinkers No. 1 and No. 2 respectively. Tensile strength briquettes were made on these samples, conforming to the A.S. T.M. specifications for this test throughout.

The results of this series of tests were tabulated as follows:

Tensile strength-pounds per square inch
1 to 3 sand mortar

	Clinker No. 1		Clinker No. 2	
	Grind	Grind	Grind	Grind
Period	No. 1	No. 4	No. 1	No. 4
2-day	278	240	215	202
3-days	329	282	265	245
7-days	425	368	368	352
28-days	505	430	476	455

Note: The above tensile strength figures represent an average of six briquettes for each breaking period.

To more clearly illustrate the effect of aging on the cementing value of clinker, the accompanying curves were plotted:

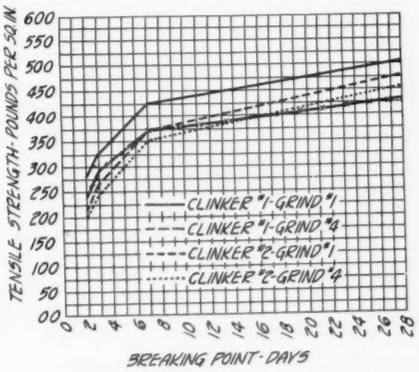


Diagram illustrating results of Experiment No. 3

CONCLUSIONS: That a lower limed clinker will lose a lesser proportion of its cementing value when subjected to aging for extended periods of time than will a higher limed clinker, both being aged under the same conditions.

That when clinker is to be stored in the open for an extended period of time, the manufacturing of a lower limed clinker than is customary will result in a finished cement of higher ultimate tensile strength.

REMARKS: The results of this series of tests do not agree with the old opinion that aging of sound clinker produces a higher quality cement.

In answer to the probable question as to why the grinding resistance increases with the increase in loss on ignition, the writer advances the following theory, which, within so far as he is aware, is, in part, original.

That when portland cement clinker is subjected to weathering or aging, a decomposition is introduced, forming calcium hydroxide crystals and crystalline compounds of lower lime content, producing a more elastic clinker and subsequently raising the tensile strength within itself, due to the higher elastic limit of the calcium hydroxide crystals.

Effect of Price War on Cement Industry in Quebec

THE AVERAGE PRICE of cement in Quebec rose from $1.12 a barrel in 1927 to an average of $1.28 for 1928 as a result of the settlement of the price war that had been going on for the two previous years.

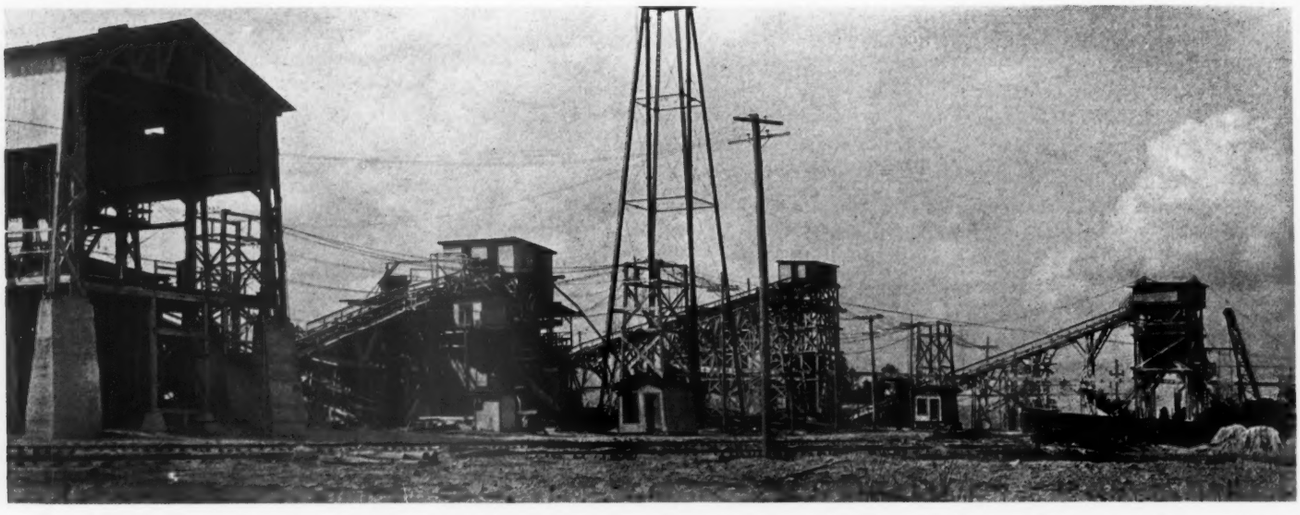
Curiously enough, the output in the province of Ontario is limited to the two groups that operate in the province of Quebec, namely, Canada Cement Co. and St. Mary's Cement Co., which is owned by Alfred Rogers, president of Elias Rogers Coal Co., who also in 1928 purchased the National Cement Co. of Montreal for an amount of $2,435,000. The output in Ontario in 1928 amounted to 3,911,795 bbl., which was an increase of just over 160,000 bbl. compared with the 1927 total. The output in Quebec was 1,000,000 bbl. greater, namely, 4,913,820. This latter total had increased 277,000 bbl. during 1928, a larger increase even in percentage than that of the province of Ontario.

The average price per barrel for the province of Ontario in 1928 was $1.41, which was 7 cents higher than the average of $1.34 in 1927. It so happens that the 1928 price worked out exactly the same as in 1926. The 1928 figure is 13 cents a barrel, on the average, above that of Quebec. In both cases prices for the past few years have shown an almost steady decline. In 1922 Ontario's average was $2.01; 1923, $1.77; 1924, $1.59; 1925, $1.52, and in 1926, $1.41. While Quebec prices during the past three years have been lower than those in Ontario, they averaged higher in the preceding years. The price of $2 in 1923 compares with $1.77 in Ontario. The output in Ontario has not varied very much for a number of years, the output between 1922 and 1928 all having been in excess of 3,000,000 bbl. There was a gain of over 800,000 bbl. between the early and latest date.

Florida's Rock Products Industries

Business Is Picking Up After a Busy Tourist Season

By Walter B. Lenhart
Associate Editor, Rock Products



View of the plant of the Consolidated Rock Products Co. From left to right they are the crushing plant, log washer, screening plant and storage and loading bins

AT THE PRESENT TIME Florida is recovering from several setbacks, the "boom" being the main disturber, and the hurricane, of lesser degree (which is not mentioned when in Florida) another. These two conditions, or temporary setbacks, caused the building industry and highway construction to take a decided slump the past two years.

However, business throughout the entire state is improving; the tourist "crop" during the recent winter season was comparable to the influx of people during the boom period. Hotel accommodations in any of the larger east coast hotels simply could not be had without several weeks' previous reservations; likewise, on the west coast of Florida, but to a lesser degree. The citrus crop during the past year was one of the largest and most valuable that the state has produced (valued at $75,000,000); to offset this, however, the people of the state imported some $30,000,000 of dairy products.

As a whole, the building industry is slowly returning to normal with some highway work in sight during the late spring and summer of this year. Building in Florida, especially street and highway work, is delayed until that time of year, so as not to inconvenience the tourists with unnecessary detours.

One highway that was completed late in 1928 was the Tamiami Trail, which starts at Miami and runs directly west to the Gulf of Mexico, passing through the famous Everglades. This highway is in excellent condition and is flanked by a drainage canal that is slowly draining the Everglades and opening up a very fertile and very large area. Small vegetables, tomatoes and cucumbers are raised here now in large quantities, and several packing companies have established packing houses in some of the inland Everglade villages, that have sprung up incidental to this new development.

Florida Highway Construction

This highway was built along somewhat the same practice employed by the State Road Department, using Florida limerock as a road base. In some cases shells are used as a base. In either event the comparatively soft base material is spread to a depth of 8 in. and is compacted by rolling to 6 in., water being used freely to aid the packing before rolling, but not during the rolling operation. The wearing surface consists of a prime coat of tar, a layer of slag and a seal coat of asphaltic binder. There may be some variations in the details of this procedure, but for this type of base it is essential that the surface be waterproof. This limerock, known geologically as the Ocala limerock, is quarried in the vicinity of Ocala, but similar deposits are found in Georgia at Perry and Cordele. The only preparation needed is to crush to minus 3½-in., which is usually accomplished in a single-roll crusher, after which the material drops direct to cars for shipment. A description of one of these plants located in Georgia, operating on this class of material, will be published in a forthcoming issue of Rock Products.

Some of Florida's highways are built of another class of limestone entirely, especially roads in the north and western sections. This rock is taken from the quarries of the Camp Concrete Rock Co. and the Consolidated Rock Products Co., both operations being within a few miles of Brooksville, Hernando county. Brooksville is about 34 miles north of Tampa.

The sales of both these two producers are handled entirely through a separate company, for that purpose, the Florida Crushed Stone Co., with home offices at Ocala, Fla. This same company also has limerock quarries of its own in and around Ocala, and at these latter operations the material is secured from the softer Ocala limerock previously referred to.

The stone secured from the Brooksville operations should not be confused with the Ocala limerock, as the former produces a much harder limestone, a stone which is suitable for concrete aggregate or for a wearing surface for asphaltic topped roads. It compares very favorably in hardness with the Mississippian limestones. Some portions of the deposit are intermixed with the other stone and yield some limestone that is ex-

Camp Concrete Rock Co. quarry, showing Pit No. 2 and incline at the right

Stripping from the Camp company quarry is sold to the railroad for fills

ceptionally hard and takes a polish quite readily. Similar to practically all of Florida's quarry operations, the deposit is highly fossilized.

In the quarry of the Camp Concrete Rock Co., referred to as the Camp quarry, the rock is in the nature of a shattered and irregular deposit, in a matrix of soft, sticky (when wet or damp), pulverant limestone. The deposit might be described as resembling an alluvial or limestone gravel, with irregular shaped and sized boulders, all partially re-cemented by a softer limestone.

Peculiar Blasting Operations

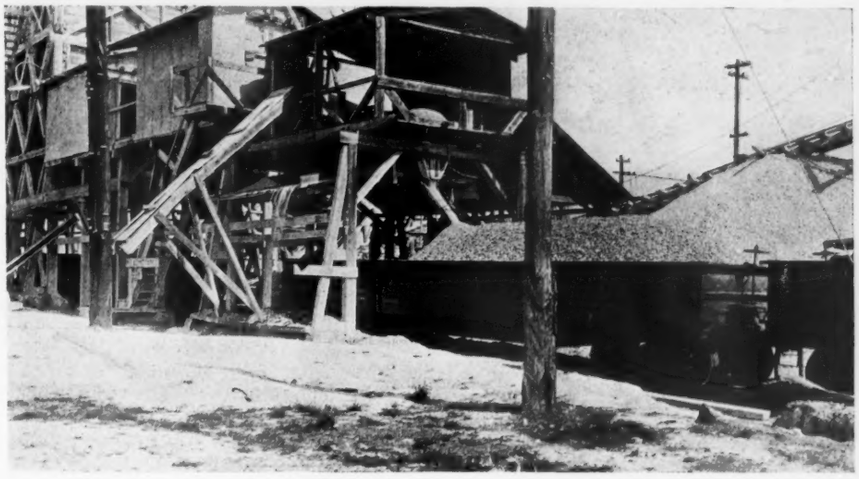
This material is such that it is possible to dig with a power shovel without shooting, but it is the usual practice to put down widely spaced well-drill holes, which are sprung with dynamite. After springing the exploded holes are charged with black powder and shot. The nature of the rock and its bedding material is too soft to permit the use of faster explosives, as the higher percentage dynamites only expand the drill hole and pack the material instead of loosening it. It is only necessary to shake up the areas being mined; and the results of blasting here are in no way comparable to the usual quarry blasting operations, where a high fragmentation is secured.

The first impression that one receives when observing this material being handled is that it is so much muck, and one wonders where the rock really is, but the facts are that the softer dust and mud completely envelop the harder stone, and it is only after crushing, washing and sizing that its true nature is revealed. It might be here said that 30 to 45% of the material taken from these quarries is this soft enveloping material which is at present a waste product. This extremely high loss is very unusual and would only be permitted in areas similar to Florida, where a hard stone of any character is difficult to get.

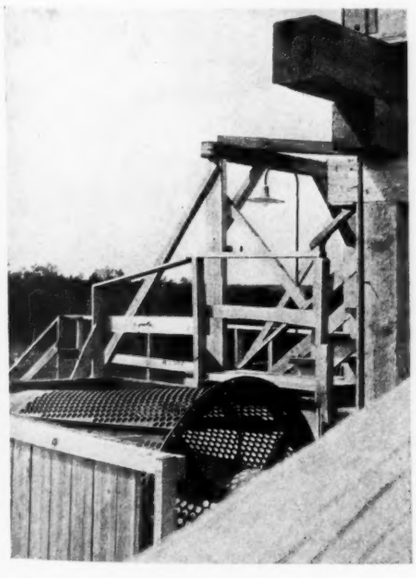
To wash a stone containing such a high percentage of sticky, clay-like material requires rather unusual equipment, calling into use log washers operated in series as well as rotary screens with water sprayed into the main barrels and at other places during the processing operations.

The Camp Concrete Rock Co. Operation

At this quarry the rock is covered with considerable overburden, which is stripped with a Bucyrus 80-B dragline with a 2-yd. bucket and an 80-ft. boom. The stripping is cast to one side, although some of this material is sold to the Atlantic Coast Line railroad for filling purposes. The rock,



Loading cars from loading bins at the Camp plant near Brooksville, Fla.



One of the screens receives coarse material from a single roll crusher

Partial view of incline and trestle at the Camp plant

Loading in the pit of the Camp plant of the Florida Crushed Stone Co.

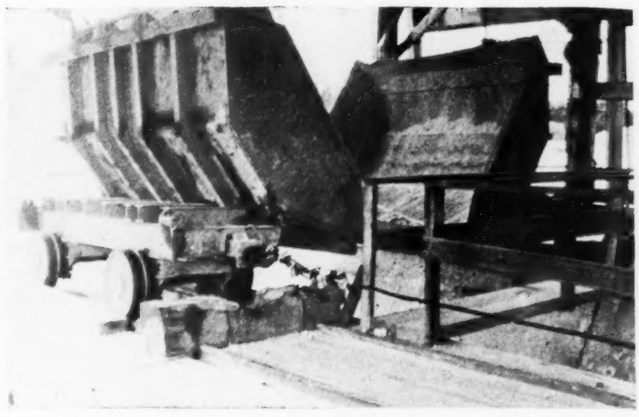
after shooting with black powder, is loaded into cars of the company's own design, holding about 3 cu. yd. of material each, by either a steam Bucyrus 35 shovel, 1¼-yd., on crawler treads, or an electric Bucyrus 30-B, ¾-yd., also on crawler treads; one of the shovels is in pit No. 1 and the other in pit No. 2. What small amount of drilling is necessary is done by a Cyclone electric well drill. An old steam rig is also available.

The cars are hoisted up separate inclines serving the two pits by a McLanahan-Stone Machinery Co. friction hoist, and end-dumped to a grizzly, where a stream of water from a fire hose washes the fines through the grizzly. The coarse material passes through a set of 24x60-in. Allis-Chalmers single-roll crushers, where the fines from the grizzly join and flow to a rotary scalper with 2½-in. perforations. The fines from the scalper pass to the first set of log washers. The oversize from the scalper falls to a 24x48-in. single-roll crusher, which discharges to a second set of log washers. The material is fed to the low end of the log washer, and the rock is carried forward and upward by the paddles of the washer, and is discharged to a 48-in. by 12-ft. McLanahan-Stone rinsing screen. This screen has a fines jacket its entire length, of 3/16-in. perforations, the interior jacket being ¼x1-in. slots. The oversize from this rinser is here joined by the discharge from the first log washer (which receives the fines from the scalper) by a 24-in. belt conveyor, which delivers the rock to a 4-roll grizzly set to 1½-in. The oversize from the roll grizzly passes through a two-roll Allis-Chalmers, 48x20-in., set of rolls. The material from these rolls is elevated to a 60-in. by 12-ft. rotary screen with a ¼-in. mesh fines jacket, and the main barrel of 1-in. perforations. The fines from the jacket are wasted and the oversize from both jackets join and are elevated to the sizing plant. The fines from the roll grizzly pass to a second bucket elevator and are also elevated to the sizing plant.

The sizing plant, or screening plant, has two rotary screens, one for the material from the crusher and the other for material from the roll grizzly. Each is equipped with a fines jacket of ⅜-in. perforations, the fines from which join and fall to a small rotary screen with ⅛-in. mesh openings, producing a ⅛-in. to ⅝-in. material called "chats"—a southern term for chips.

These two rotary screens produce a variety of sized stone, ranging from 2½-in. to ⅜-in., which falls to small loading bins below. The oversize from the main barrel is returned to the rolls by a belt conveyor.

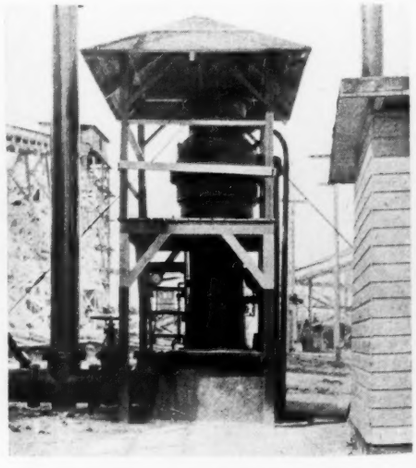
The bins under the rotary sizing screens are directly over the loading tracks and the rock is received by a 24-in. belt running the length of the bins, from which the proper, specified, proportioned mix is drawn to this belt, and from here the rock is end discharged to the cars below.



Dumping cars at primary crusher at the plant of the Consolidated Rock Products Co.

Washing and crushing plant of the Camp Concrete Rock Co., at Camp, Fla.

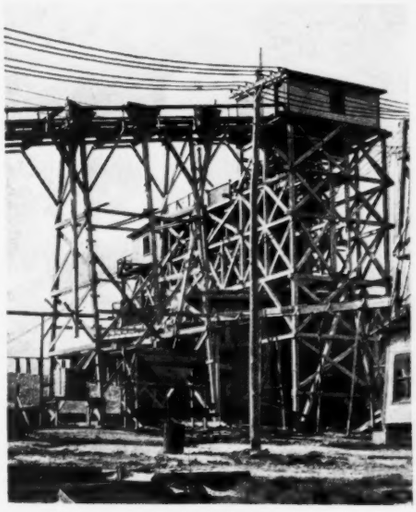
Belt conveyor from log washer to screening plant at Consolidated Rock Products Co.



Deep well pump delivers 2500 gal. per min. from a depth of 638 ft.

Rock can also be drawn from the sides of the bins to a tram car which is hoisted up an incline to a trestle over a stockpile. A ¾-yd. Koehring gasoline-driven crane is used for reclaiming the stored stone.

The plant is driven by electric motors through a series of countershafts. It requires 950 hp. to pull the entire load, which includes water pumps and hoisting operations. The plant has a capacity of 1000 tons of stone per day, which requires 1400 to 1800 tons of quarry output on account of the waste already mentioned. For capacity production 45 men are required.



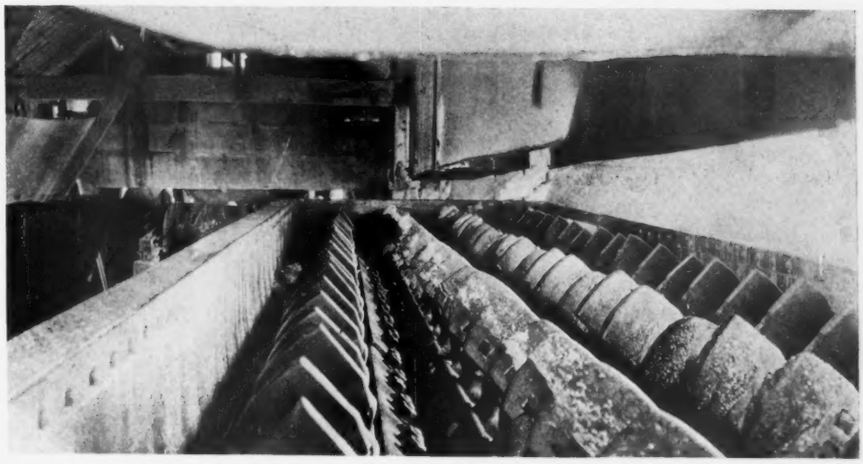
Hoppered chutes on side of incline for removal of clay balls by hand sorting

Water is secured from a 60-ft. pit alongside the plant, in which are two 8-in. De-Laval centrifugal pumps, direct-connected to 75-hp. motors, one a Westinghouse and the other a General-Electric. Power is purchased from the Florida Power Co.

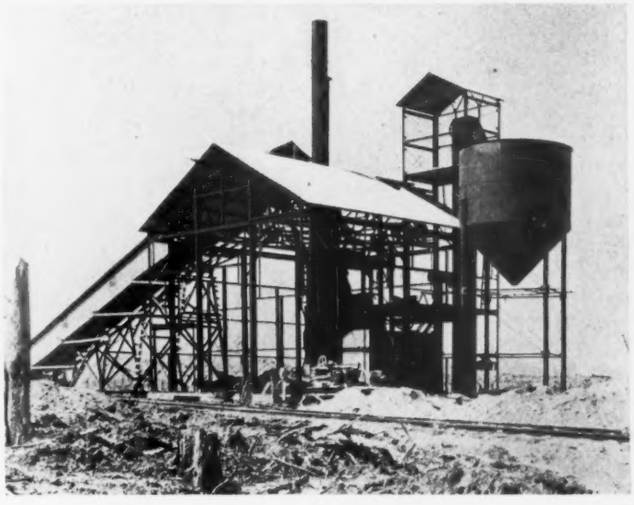
The Consolidated Rock Products Co. Plant

The Consolidated Rock Products Co.'s plant was not operating at the time of inspection, partly due to the policy of the new consolidation to operate one plant to capacity instead of two at half-capacity. During this shutdown the equipment was all being overhauled and a new conveyor belt from the primary crusher to the washing plant was being installed.

The character of the rock is identical with that at the Camp operation, it being only a few miles between the two quarries and on the same extended deposit. The flow of material is in principle the same as at the former plant, and log washers are used here also for removing the soft matrix from the harder stone which it coats in the raw state.



Type of log washer used at both plants of the Florida Crushed Stone Co.



Initial unit of the new gypsum plant of the U. S. Phosphoric Acid Co., near Tampa, Fla.

The quarried stone is loaded by a 3-yd. electric Bucyrus shovel to Easton, side-dump cars, which discharge to a Stephens-Adamson pan feeder serving a Pennsylvania single-roll crusher. The crusher discharges to a second Stephens-Adamson pan feeder, which delivers the stone to a 36-in. belt conveyor, which in turn supplies either of two Stephens-Adamson scrubber screens. The first three sections of this screen are blank,

Sizing plant with drag lines for stock piling

An 8-yd. bucket for electric dragline compared with an auto

Hydraulic stripping of overburden of phosphate deposits near Nicols, Fla.

An electric dragline with 8-yd. bucket stripping phosphate deposit near Lakeland, Fla.

and these sections act merely as a tumbling barrel to disintegrate the clay-rock mass. The middle portion consists of one section of 1-in. round perforations with an end section of 2¼-in. perforations. A liberal amount of water is supplied to the barrel for washing. The oversize discharges to a 36-in. return belt conveyor, delivering the rock to a 24x54-in. Buchanan two-roll crusher, which discharges to a 24-in. belt conveyor serving a set of 28x54-in. Allis-Chalmers rolls. The discharge from the rolls passes to the main 36-in. belt ahead of the scrubbers. The minus 2¼-in. material can be diverted to a Symons cone crusher, which discharges to an Allis-Chalmers log washer, or can pass direct to the log washer without this additional crushing. The minus 1-in. material from the middle section of the scrubber likewise falls to a second log washer, and the discharge from this washer joins that of the second log washer and is conveyed by a long 24-in. belt conveyor to two batteries (of three each) Stephens-Adamson improved Gilbert cone screens, operating in parallel. The first two screens deliver a 1½-in. stone, the second 1-in. and the third ¾-in. and ⅝-in., the various sized materials falling to ground storage below, where they can be stockpiled by Sauerman scraper buckets and cableway.

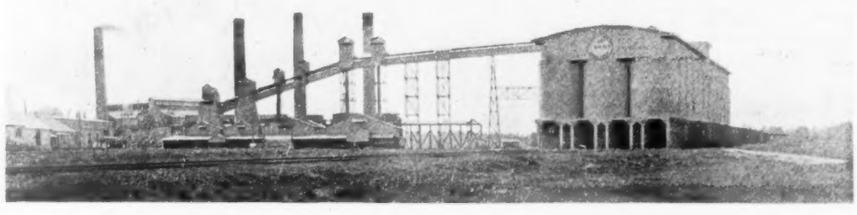
The stone is reclaimed by a belt conveyor running in a tunnel under the pile, but it is necessary to use the Sauerman scrapers at times to bring the material to the belt feed gates. The reclaiming belt elevates the stone to a single Gilbert scrubber for a final washing before loading. A small rotary sand screen is also available in the event sand is called for, this equipment having ⅛-in. wire mesh, and if coarse sand is desired the oversize is saved, and any finer sands are recovered by a home-made sand separator.

Gold in Fine Waste

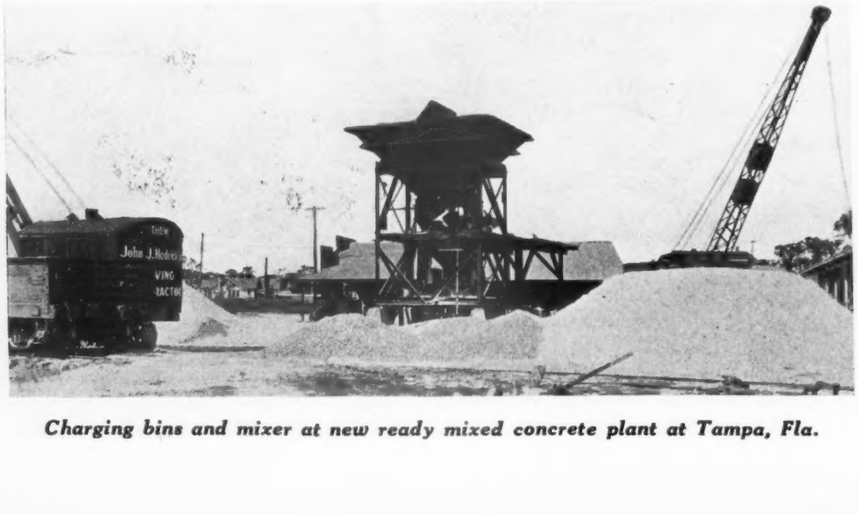
The plant has a capacity of 2500 tons per day, reclaiming 55 to 60% of this tonnage, the balance going to waste ponds and is saved. These fines are said to contain gold and assays as high as $6.40 per ton have been secured, but the average value per ton runs between 40 and 60 cents. The company has spent considerable money on research in an attempt to recover these values commercially, but as yet the metallurgical problem has not been successfully solved. The operation employs 100 men when operating to capacity, has 28 electric motors, 25 being General-Electric and three Allis-Chalmers, which require a total of 1565 hp. to operate. The plant is on the Atlantic and Seaboard railroad, and power is purchased from the Florida Power Co.

Water for washing is supplied by a 10-stage, 24-in. Worthington deep well pump delivering 2500 g.p.m. from a depth of 638 ft.

The executive officers of the Florida Crushed Stone Co. are: Jack Camp, president; E. F. Fitch, vice-president, and C. W. Stone, sales manager. The Camp plant is supervised by D. L. Ghiotto, assisted by L. J. Bray. A. M. Luttrell is superintendent of the Consolidated Rock Products Co. plant, Dan McIntyre, master mechanic, and L. D. Williams is in charge of the office.



Drier and storage bins of the American Agricultural Corp., Pierce, Fla.



Charging bins and mixer at new ready mixed concrete plant at Tampa, Fla.

Cement Manufacture in Florida

Florida cement producers have been hampered seriously in the past, when business was thriving in other rock products industries, by importations of cement from Belgium—to a lesser degree at present, mainly for the reason that the market is not there now. But when conditions return to normal, unless cement is protected by a suitable import duty, these foreign shipments will no doubt be resumed and result in further crippling Florida's only cement producer.

The plant of the Florida Portland Cement Co. is located in Tampa, and was described in detail in the November 26, 1927, issue of Rock Products. At the time of my visit it is working at about 60% capacity.

It was unusual to note that with a cement plant within the city limits of Tampa proper, practically all the streets and highways for miles around leading into Tampa are of

brick; a few highways are of asphalt block and other asphaltic materials, but practically none of portland cement concrete. With a good grade of stone now available so close to Tampa, this condition should and probably will be corrected, as the cost of repairing brick pavements, turning over the bricks from time to time, correcting their alignment and a dozen other smaller items of upkeep expense are items of cost that a well laid concrete pavement is not subject to.

Phosphate Industry

The phosphate fields that extend in more or less of a semi-circle eastward from Tampa were visited, including the plants of the International Agricultural Corp. at Mulberry, the Phosphate Mining Co. at Nichols, the Southern Phosphate Corp. at Lakeland (which strips its deposit with a new 8-yd. Bucyrus-Erie electric dragline), and the American Agricultural Corp. at Pierce. More will be said in a later issue of ROCK PRODUCTS regarding developments in this field, including a detailed description of the new gypsum plant of the United States Phosphoric Products Corp., which will be placed in operation early this spring. This company is installing calcining equipment, tile plant, etc., and will use synthetic gypsum secured as a residue from the production of phosphoric acid from Florida phosphates.

Ready-Mixed Concrete Plant

One of Tampa's most recent industrial enterprises was the establishment of a small but efficient ready-mixed concrete plant at 3002 Granada street, by the John J. Hedrick Co., of which John J. Hedrick is president and general manager.

The equipment consists of Blaw-Knox batchers, a Koehring mixer, a Thew full-revolving crane on crawler treads, using a 1¼-yd. Blaw-Knox "Dreadnaught" bucket. A Koehring crane on full crawler treads with a 1½-yd. Owen bucket is also available. No mixer trucks or agitator trucks are used by Mr. Hendrick, as he claims that the wet-mixed concrete gets sufficient agitation while traveling over Tampa's *brick streets,* and there may be good basis for this statement.

Effect of Moisture on Rock Toughness

AN engineer having reported to the United States Bureau of Public Roads that there were failures of road metal in India when it was thoroughly saturated with water, the Bureau decided to investigate the relation between the toughness of rock and its moist condition.

Tests were made on sandstone, three kinds of limestone, diabase and granite. The results are given in table form in *Public Roads* for November, 1928. None of the samples tested showed a lessened toughness after being saturated with water.

An Abrasion Test for Sand

ONE of the difficulties of testing sand for use as fine concrete aggregate has been the lack of a suitable abrasion test so that the question of what constituted the "hard and durable grains" called for by specifications had to be left to a personal judgment. But D. O. Woolfe, assistant materials engineer of the United States Bureau of Public Roads, describes a test in the January issue of *Public Roads* the results of which seem satisfactory.

Like all the other abrasion tests, the method used is that of running the sample in a Deval cast-iron cylinder with steel balls. But the earlier tests tried were on natural sands and they could not be compared as the grading of each sample differed from the others. And grading, as Walker's recent paper shows, is the most important factor of those which affect abrasion tests.

For the test described in the article referred to the sand is separated into sizes and these sizes are re-combined to the grading which is considered to be that of a typical concrete sand, namely:

¼-in to 10-mesh	20%
10-mesh to 20-mesh	20%
20-mesh to 30-mesh	25%
30-mesh to 40-mesh	20%
40-mesh to 50-mesh	15%

A 500-g. sample of this re-combined sand is placed in the Deval cylinder with ten ¾-in. steel balls and given 2000 revolutions at 30 to 33 r.p.m. Then it is screened, the percentage passing 50-mesh being taken as the loss by abrasion.

Interesting comparisons are made in the paper between the loss by abrasion and the tensile strengths of mortar made from the sand after it had been given this standard grading. (The fineness modulus is 3.1—Editor) There is no apparent connection between the two, some of the sands which show the highest tensile strength having a high percentage of wear. The paper calls attention to this and says that an abrasion test is needed with such sands to avoid a misinterpretation of the strength test.

The paper says that the losses by abrasion in the test are almost wholly due to the minerological composition of the sands, the losses being greater on sands containing sandstone, mica, feldspar and limestone. A footnote states that limited tests on the effect of the shape of the grains failed to demonstrate that this caused an appreciable variation in the loss by abrasion.

As important a result as any of the tests is the comparison of the loss by abrasion with the resistance of the mortar made from these sands to freezing and thawing. Those showing the highest loss in the abrasion test showed the highest loss of strength after 20 freezings and thawings.

The samples were the routine samples of sands used in highway concrete of federal aid construction. By comparing the work of field engineers on the service behavior of roads with the abrasion losses of the sands a criterion has been established. This places the percentage of wear permissible at 9, but the paper says that allowance must be made for the availability of local materials and for sands containing many grains from sedimentary rocks. But clean, well graded sands having an abrasion loss of 9 or less the paper says should be satisfactory for use in concrete pavements.

Sales of Phosphate Rock in 1928

THE TOTAL QUANTITY of phosphate rock sold or used by producers in the United States in 1928 was 3,439,921 long tons, valued at $12,339,850, states the Department of Commerce in summarizing figures compiled by the United States Bureau of Mines from individual reports furnished by producers. The figures for Florida were collected in co-operation with the state geological survey. The compilation indicates an increase of 8% in quantity and 10% in value, as compared with 1927. The quantity and value, by states, of the various kinds of phosphate rock sold or used by producers in 1928 were as follows:

	Long tons	Value
Florida: Hard rock	92,627	$ 370,508
Land pebble	2,729,334	8,953,798
	2,821,961	$ 9,324,306
Idaho: Western rock	37,477	147,908
Tenn.: Blue and brown rock	577,095	2,853,237
Wyoming: Western rock	3,388	14,399
	3,439,921	$12,339,850

Florida continued to lead in production, and was the source of 82% of all the phosphate rock sold or used by producers in the United States in 1928. Land pebble rock constituted 97% of the Florida output in 1928, and showed an increase of 9% in quantity and 10% in value, as compared with 1927; the average value f.o.b. mines was $3.28 a long ton in 1928, as compared with $3.24 a ton in 1927. The hard rock production in 1928 decreased in both quantity and value, as compared with 1927; the average value f.o.b. mines in 1928 was $4 a long ton, the same as in 1927. The production of phosphate rock in Tennessee in 1928 showed an increase in both quantity and value, as compared with 1927, and the average value a long ton was $4.94, as compared with $4.81 in 1927. The quantity of phosphate rock sold or used by producers in the western states in 1928 decreased 21 per cent as compared with 1927.

Imports of phosphate rock in 1928 were 45,812 long tons, valued at $431,238, or an increase of 62% in quantity and 47% in value, as compared with 1927. Exports amounted to 898,764 long tons, valued at $4,453,101, a decrease of 2% in quantity and 6% in value, as compared with 1927, and included 92,517 tons of hard rock, valued at $626,238, and 806,247 tons of land pebble and other rock, valued at $3,826,863.

A Few Thoughts Regarding the Cement Service Laboratory

By Edgar S. Ernst
Davenport, Iowa

IT HAS BEEN said that the portland cement, though one of the most convenient and widely used of building materials, both in extent of territory in which it is employed and variety of purposes to which it is put, has been subjected to a greater amount of abuse and unjustly blamed for a larger number of failures than all of the rest combined. It might be called the "goat" of the building trade, for it is much sought after when there is work to be done, but usually receives the major portion of the blame for failures, whether deserved or not.

The truth in the statement is being constantly brought home to those in touch with the cement industry who are, therefore, in a position to know of the quite general high quality of the cement on the market today and what can be done with it when it is properly used. A product which is manufactured with painstaking care under the direction of trained operatives, and which is subjected to the constant and rigid inspection which portland cement receives today, should be given at least a reasonable "break." It is, of course, true that all cements are not equally suited to all purposes. That is to be expected when one takes into account the number and variety of raw materials from which they are produced. Plant equipment and methods vary also and play an important part in producing differences in the action of their product. Some cements show one quality to advantage, some another, but all must meet the same general, high standard specifications; specifications which, when met, render small indeed the chances that the cement warrants even a fraction of the blame for the concrete failures which are regularly credited to it.

Concrete—Not Cement, the Finished Material

These standard specifications have been adopted by the A. S. T. M., various state highway departments, city governments and the several departments of the United States government, and set forth the minimum requirements that all portland cements must meet. They have been developed and tried under the most exacting conditions, thereby placing the responsibility for concrete failures in another quarter when cements satisfying these specifications have been used in the work. Portland cement is by no means a finished building material as we all know, since it is very rarely, if ever, used without the addition of some material other than water, and while all alert cement manufacturers will, of course, guarantee the quality of their cement, none of them can, or will, guarantee concrete made from it unless adequate provisions have been made to insure its being employed in the proper manner.

Repeat orders are the life of a business. A good line of sales talk or the personality of the salesman may contrive to make the initial sale, but future business depends largely on the quality of the product sold and the satisfaction given with this first order. One of the best means of assuring this satisfaction is to educate the consumer in the best ways to use the product so as to obtain good and lasting results, while still protecting his interests by doing it in the most economical manner possible. This thought has been expressed so often in this connection that it is almost trite to repeat it. In doing so, however, it is only fair to say that the chief aim and purpose of the Portland Cement Association is to carry on such a program of education based on thorough investigations.

It has carried out numerous studies and tests in an effort to gain definite information concerning the action of portland cement under various conditions of mixing, placing, curing; the proper materials for use and the effects of various proportions on the strength and wearing qualities of the concrete; the effects of alkali waters, and a host of other materials and conditions. One of the outstanding results has been the development of what it has seen fit to call the "water-cement ratio" method for control of concrete strengths. This makes use of the principle which had long been known to many cement users, that an excess of water lowers the strength of concrete, but presents it in a scientific manner for the first time. Heretofore there was some question as to just what constituted an excess of water. Now, by the use of this method and several tables worked out by the association's experts, all other conditions being favorable, we are able to design a concrete mixture which will satisfy any predetermined strength within reasonable limits with a fair degree of accuracy.

The damage produced by an increased water-cement ratio does not end with the immediate lowering of strengths, but, when carried to excess, also greatly increases the tendency of the constituents of the mix to segregate, which, in turn, results in porous, honey-combed concrete. This latter condition, aside from the fact that it detracts from the appearance of the job, allows water to permeate the concrete with consequent damage from frost (see Fig. 1) and alkaline waters, in those sections where these factors must be met.

Modern Theories of Concrete Strength

The old idea that concrete strength is controlled solely by the quantity of cement in the mix has been put into the discard by progressive engineers as a result of the quite general acceptance of the water-cement ratio principle. Neither is the grading of the aggregate given the high place it once held. Both of these ideas, however, when modified to conform to modern theories can play a most useful part in the economical design of concrete mixtures and have great bearing on the final product. Their effect is more indirect than direct, however. The aim of all engineers is to produce a concrete that will satisfy as nearly as possible the optimum conditions of strength, wearing quality

Fig. 1. Concrete surface damaged by frost and alkaline water

and economy. Since the cement is the most expensive constituent of the mix and proper grading of aggregates has the effect of lowering the amount of cement and water necessary, by reducing the percentage of voids and thereby producing a more dense and stronger concrete, it is plainly to be seen that it is a decided advantage to use a well-graded mixture. Grading of the mixture automatically does away with the possibility of having too great a proportion of fines in the mix, which would tend to increase the water-cement ratio (or the amount of cement used, in the event that this ratio was kept constant) in order to produce the required workability. Such an excess of water, as mentioned above, would result in lowered strength, or increased cost in the event that the ratio was kept constant.

During its comparatively short life the P. C. A. has made thousands of tests and distributed the information so gained to the public, to the very great help of the cement industry and cement users. But, with all of its work, and that of others, there are still thousands of consumers, some large and some small, who have not become acquainted with the results of its investigations. They still continue to use the old antiquated methods which have not only been proven directly wasteful but positively harmful to the quality and worth of their product.

Need of Cement Company Service Laboratories

This is one of the reasons that it is especially gratifying to notice the evidences of increasing interest on the part of the individual cement companies in supplementing the work of their central body by establishing service laboratories* at their plants, where the consumer may bring his problems and receive expert scientific advice in solving them. This is their main purpose, of course, but they will aid also in greatly increasing our knowledge of cement and its behavior under various conditions; and by the dissemination of this information will tend to eliminate many of the present sources of criticism by bringing before the public the harmful effects of the use of faulty methods and of materials which are poorly graded or contain injurious ingredients.

These laboratories will naturally reach a class of consumer which the Portland Cement Association will not. This class includes the small rural consumer who may use only a few barrels a year, a small item when the individual is considered, but totaling an enormous volume when the country as a whole is taken into account.

By furthering an active campaign of education these laboratories should materially lessen unwarranted criticisms being made against the cement because of concrete failures. They should serve as a boon to the plant chemists also. Heretofore, many of them have been compelled to take care of most of the "trouble-shooting," though their laboratories were inadequately equipped for properly doing so in many cases.

In spite of the fact that all concrete aggregate specifications stress the point that sand and gravel, or crushed stone, should be composed of clean, hard, durable, *uncoated particles* free from injurious amounts of dust, lumps, soft or flaky material, shale, alkali, organic matter or other deleterious substances, and that much has been written showing the ill effects resulting from the use of aggregates which do not meet these specifications, many attempts are made to use it. In the majority of cases, this is not done through a disregard for the warnings, but, rather, due to insufficient knowledge of the proper methods and materials to use.

Fig. 2. The dark spots on sand sample on the edge are sticks and grass roots

This point is brought out in the several examples given below. Several of them illustrate the use of faulty materials which brought forth unwarranted complaints against the quality of the cement which was mixed with them in a vain attempt to produce good concrete.

Some "Horrible Examples" of Aggregates

Fig. 2 shows a sand which was used in making a runway through a cow-barn. It consisted of a sand composed entirely of fines (grading and fineness modulus given below), which the farmer using it had dug from a shallow drainage ditch, where it usually accumulated after rains. On testing for organic matter by the usual field test, recommended by the association, a dark, coffee-brown solution was obtained, showing the presence of an excessive amount of injurious matter. (The dark specks which appear in the illustration as a fringe around the pile of sand consisted of small sticks, grass-roots, decomposed leaves, etc.).

The cement and sand were mixed in the ratio of 1 to 4 (user's estimate); no coarse aggregate was added, and the mixture was put down during the winter months with no protection to prevent freezing. The extreme fineness of the sand made it necessary to add a very great excess of water to make the mixture workable. (No cement was added to take care of this.) When the mortar

Fig. 3. Pencil points to thickly coated pebbles

failed to harden properly, the cement was blamed for the trouble. But, when some of the remaining cement was tested, it was found to have normal setting properties and to give a tensile strength from 60 to 70% over that required by the standard specifications, clearly demonstrating that the fault did not lie in that quarter.

MECHANICAL ANALYSIS OF THE SAND

	Per cent
Passing 14-mesh retained on 28-mesh	0.1
Passing 28-mesh retained on 48-mesh	7.3
Passing 48-mesh retained on 100-mesh	86.6
Passing 100-mesh retained on 200-mesh	4.5
Passing 200-mesh	1.5
	100.0
Fineness modulus	1.01

Fig. 3 shows the character of the aggregate employed by another small consumer. His complaint was that the concrete did not set properly or show good wearing qualities. The material used was an unwashed run-of-bank gravel containing a large amount of silt, sand lumps and thickly coated pebbles. (The latter are indicated by the pencil.) The test for injurious organic matter was very unfavorable also.

This man, though quite progressive in his

Fig. 4. Another sample of coated pebbles

*Such as the laboratories established by the Huron-Wyandotte, Southwestern and Nazareth portland cement companies and others.

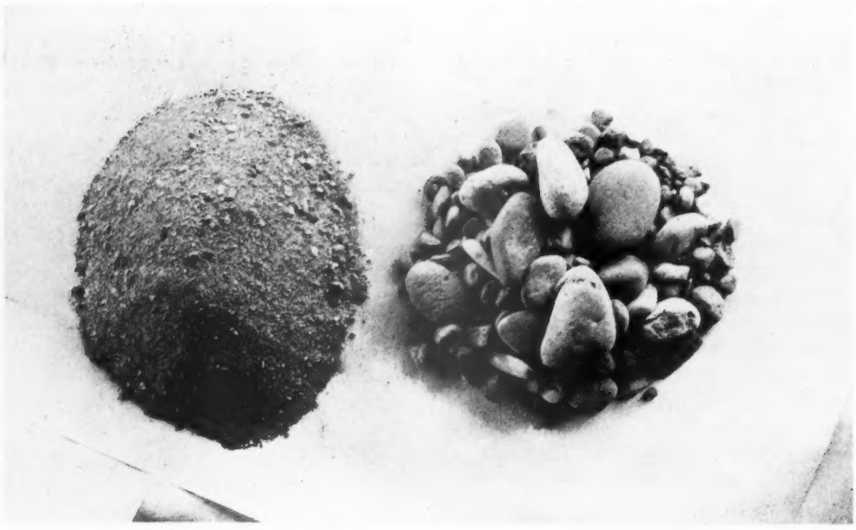


Fig. 5. Samples of sharp sand and clean uncoated pebbles

regular line of work, was unfamiliar with cement or its behavior and, therefore, did not realize that the coating on his gravel prevented the cement from coming into contact with it, leaving the bond between the particles no stronger than that provided by the coating. Neither did he realize that the strength of his concrete was cut down by the presence of the large amount of organic matter.

Fig. 4 illustrates a similar case. Fig. 5, in contrast to the others, illustrates material which was composed of clean, sharp, uncoated sand and good gravel. The sand was well graded and gave favorable mortar strengths. This material was submitted for test for the purpose of ascertaining its suitability for use in concrete. By so doing the trouble and unnecessary expense experienced by the others mentioned were eliminated.

In the first instance cited it was quite easy to detect the source of trouble, for it was apparent at a glance that the sand was composed of too large a proportion of fines and that it contained injurious organic matter. This is not always the case, however, as indicated by an instance which was brought to the attention of the writer several years ago. Here the trouble lay with the sand also, but, in this case, it appeared well graded and to the unaided eye was apparently clean and free from injurious ingredients. It was snow-white in appearance but stained the hands a dirty black when a quantity of it was rubbed between the palms. The organic test showed it to be entirely unfit for use. Further tests confirmed this.

These few examples serve to illustrate, in part, a condition which is widespread and which the service laboratories, mentioned above, should do much toward remedying. In each case mentioned, where there was trouble, the consumer was only too glad to correct conditions when his mistakes were pointed out. But, had they been better informed in the first place and pursued the policy of having their materials examined before use, it would have been much better for all concerned.

There is the field for the cement company service laboratory. It is a field of wide extent and by no means confined to post mortem diagnosis and cures. By cooperating with the consumer and those agencies that supervise the use of cement much good of lasting value could be accomplished. Intensive research for more and better uses for cement and concrete should certainly form a part of its activities. This, in itself, with its promise of tangible returns, furnishes justification for the establishment of existence of such a laboratory.

Testing Highway Materials

THE DEPARTMENT OF AGRICULTURE has issued Bulletin No. 1216, "Tentative Standard Methods of Sampling and Testing Highway Materials," a book of 132 closely printed pages. All the methods included have been adopted by the American Association of State Highway Officials and approved by the Secretary of Agriculture for federal-aid road construction.

Almost half of the book is given to tests on materials produced by the rock products industry. The remainder is given to tests on bituminous materials, metals for reinforcing, and on various sorts of culverts, guard ropes and other highway accessories.

Most of the methods are the tentative standard or full standard methods which have been adopted by the American Society for Testing Materials. Those which are not are for tests for which the society has no standard and some methods which are based upon the society's methods. But some of the methods which are not found in the A. S. T. M. reports are extremely important, however, examples being the impact test for gravel devised by the Bureau of Public Roads and the zinc chloride test for shale in aggregate. Some of the tests are alternative methods. Two or three different methods for determining specific gravity of aggregates and for determining the percentage of soft stone in gravel are included. So far as has been noted, all the methods given are those well known to testing engineers and regularly used by them, and all relating to the rock products industry have been published at one time in ROCK PRODUCTS.

While the methods are known and used by those interested in such matters, so that there is nothing novel in the contents of the book, its official character makes it very important. Methods which have been adopted by the state and federal highway authorities and by the American Society for Testing Materials must necessarily have the highest standing, not only in the engineering profession but in courts of law.

A Credit System for the Building Industry

THE Allied Construction Industries Committee is a national committee composed of representatives of the National Associations of General and Specialized Contractors. Its purposes and interests are widespread, and one subject it has been concentrating on is a plan for handling construction credits. The committee has devised a credit plan, a full description of which appears in pamphlet form, issued by the office of the secretary, Ward P. Christie, 1150 Munsey Bldg., Washington, D. C.

The credit system in outline consists of seven essential elements, as follows:

(1) Formation of a local governing board from the contracting groups and this board to supervise the formation of standard credit terms and to maintain the standard set.

(2) Reporting of overdue accounts to a trustworthy credit agency.

(3) Development of standard credit terms by agreement between each local buyer and seller group.

(4) Curtailment of credit on overdue accounts.

(5) The credit bureau, being a fact-finding and reporting institution, will take no part in maintaining standard enforcement, which will be in the hands of the credit board.

(6) Supervision of credits or the policing of practices and transactions, with the enforcement effective through moral suasion, publicity, and to some extent by the authority residing in the purchasing power wielded by responsible buyers.

(7) Judicial relaxing of standard terms when warranted by special conditions.

In the pamphlet three methods are outlined for installing the system, one method calling for voluntary cooperation between local craft associations, the second method being outlined for communities where local trades are not separately organized but maintain a central organization, and the third method employing a new association composed of single-craft organization members.

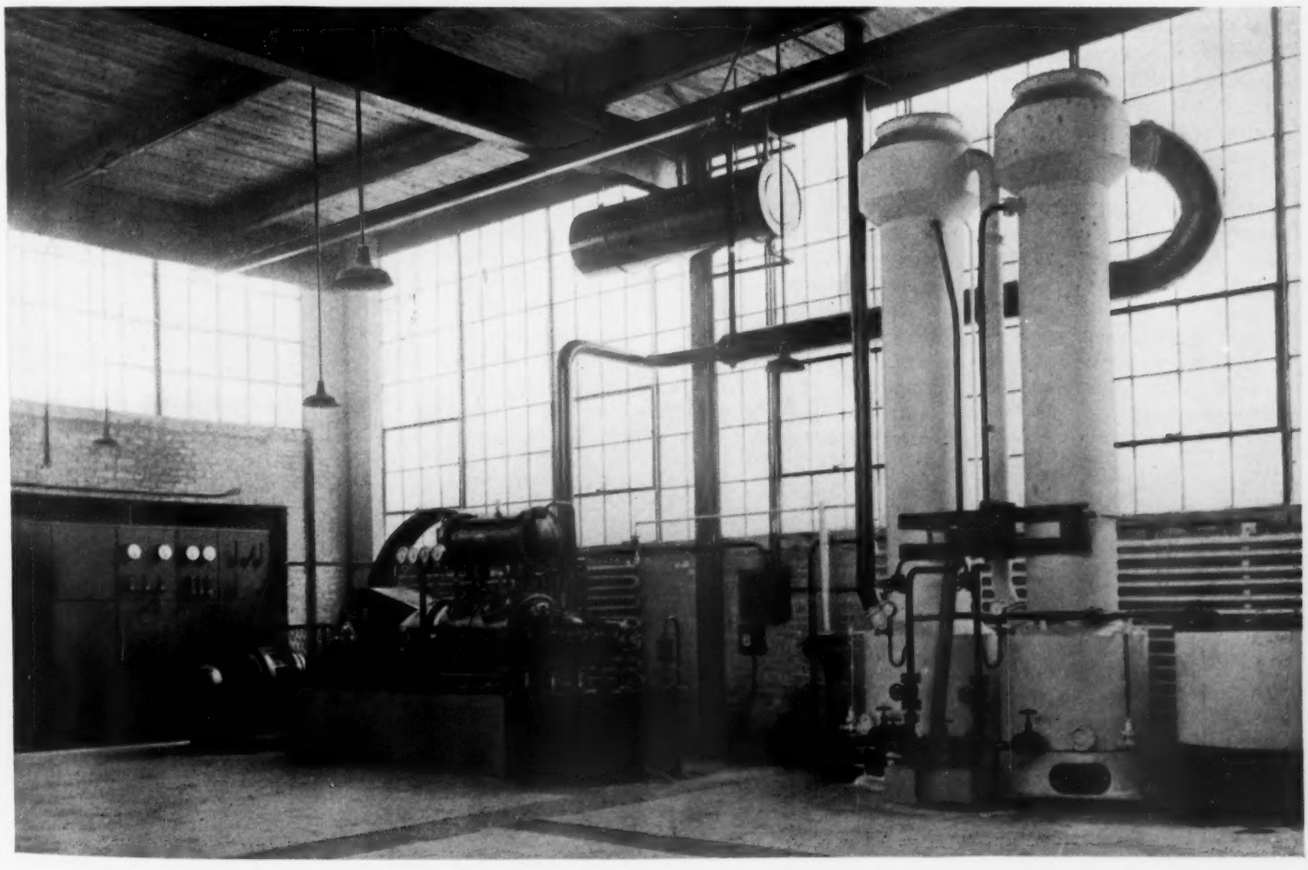
Liquid Oxygen Plant Supplies Quarries Near Chicago

THE Loxite Co. strategically located, in the center of the large quarry district of Cook county, at Hodgkins, Ill., is operating a liquid oxygen plant in connection with the preparation and distribution of Loxite (L.O.X.) explosives. The Loxite plant is an attractive concrete and brick, one-story structure, provided with large steel frame and sash windows, which provide an abundance of light and circulation of air and an attractive appearance.

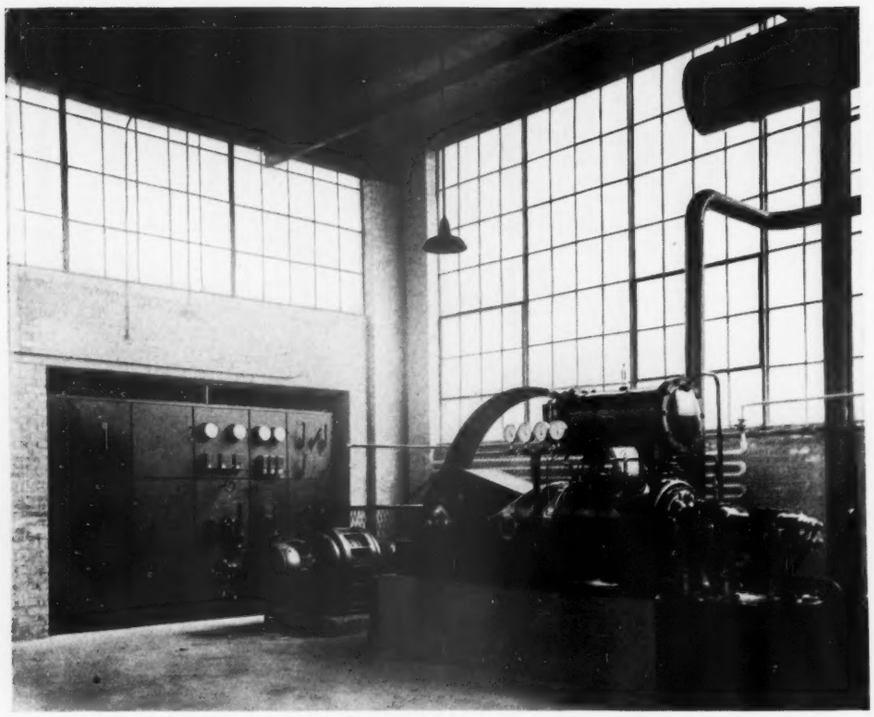
The plant of the Loxite Co. where liquid oxygen is procured

The plant proper consists of three units, the oxygen liquefaction or manufacturing department, the cartridge department and the saturating or impregnating department.

The oxygen liquefaction building is a well lighted and ventilated structure which houses the large compressor and liquefaction apparatus. The room itself is painted white and immaculately clean. The compressor is black, and the rest of the apparatus is white. All piping and connections from the several machines are below the floor level in concrete ducts and cast iron floor plates flush with the concrete floor. All heating coils are suspended on the side walls of the way. All bends and connections in the heating coils are welded, which is noticeable because of the absence



One view of the liquefaction department. Electric motor-driven compressor and purifying towers. Tank for mixing caustic potash at extreme left



Four-stage air compressor. Inter-cooler is seen mounted above the compressor cylinder, after cooler at extreme right under compressor cylinder

of screwed fittings on the piping system.

A caustic potash solution is mixed to a definite strength in a tank (A) of sufficient capacity to supply the air purifying towers. The solution is introduced through a suitable control valve into the first purifying tower, (D-1). Here the solution is put into circulation by the caustic solution pump (C). Circulation is accomplished in the second tower (D-2) by the same pump. After a definite number of operating hours, the strength of the solution in tower D-1 deteriorates, due to the absorption of carbon dioxide; it is then discharged. The solution in tower D-2, however, retains considerable strength and is therefore pumped back into the mixing tank through a drain valve over the tank. After being tested and brought to the proper strength, this solution from tower D-2 is run into tower D-1 for further use. Tower D-2 is then charged with a new solution as before.

Air Purifying Towers

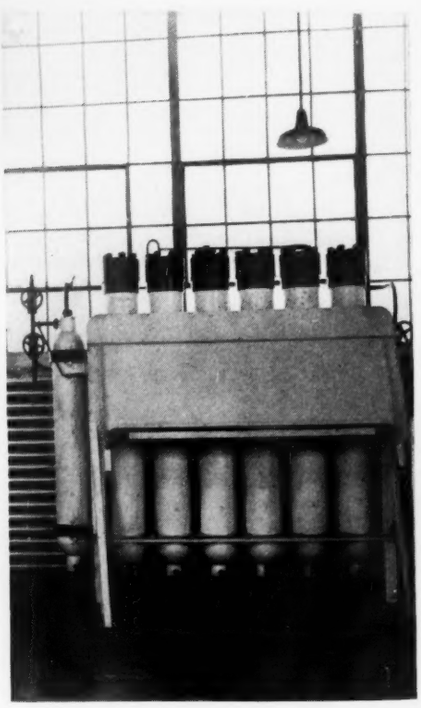
Air from the outside is drawn in through the intake pipe by the action of the compressor (E) and enters at the bottom of the first purifying tower D-1. In ascending, the air comes into contact with the solution sprayed from the upper part of the tower and flowing down over closely packed baffling devices. Thus there is a constant flow of air passing upward through and around the baffles and a constant stream of caustic solution trickling downward and absorbing the carbon dioxide content of the air. Before leaving each tower, the air passes through a separator designed to catch any small particles of caustic or other foreign matter.

The former practice of using coke for baffling material has been abandoned in favor of filling the interiors of the towers with small sections of open iron pipes. This eliminates carrying over coke dust in the line of air travel and the possibility of coke particles clogging the sprayers. The towers are in series with suitable piping and valves admitting the drainage of spent solution and its renewal with no interruption of continuous operation.

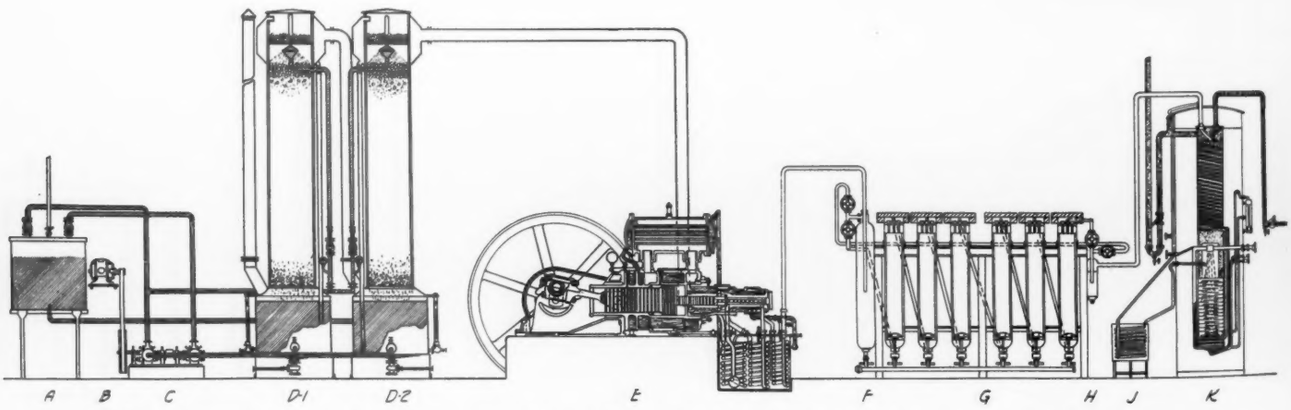
Four-Stage Air Compressor

The purified air, drawn through the air purifying towers, passes into the compressor, where it is raised to the pressure required for liquefication by expansion of the compressed air through an expansion valve in the liquefication column K.

This type of air compressor has been de-



Drying battery composed of six cylinders, three used at one time. Oil purge flask at left



Schematic sectional view of plant producing liquid oxygen from the air by the Oxeco liquefaction process

veloped to the highest point of efficiency for this specialized service by many years of experiment, development and use in the field. It is compactly designed and carefully balanced. Stuffing boxes are entirely eliminated by the use of piston rings throughout for all sliding joints. It is designed and constructed so that no air can possibly be drawn into the compressor except through the inlet valve of the first stage.

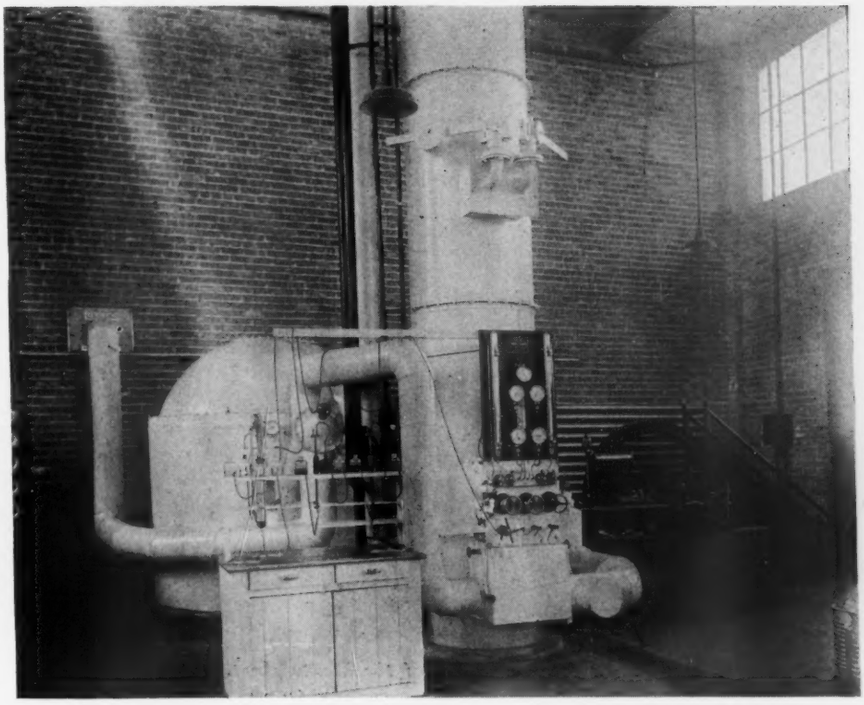
The second stage of compression takes place on the out stroke and the first, third and fourth stages on the in stroke of the compressor.

Automatic plate valves are used throughout and may be readily removed for inspection. A force feed lubrication system provides positive and thorough lubrication for all cylinders and moving parts. All parts of the compressor are easily accessible.

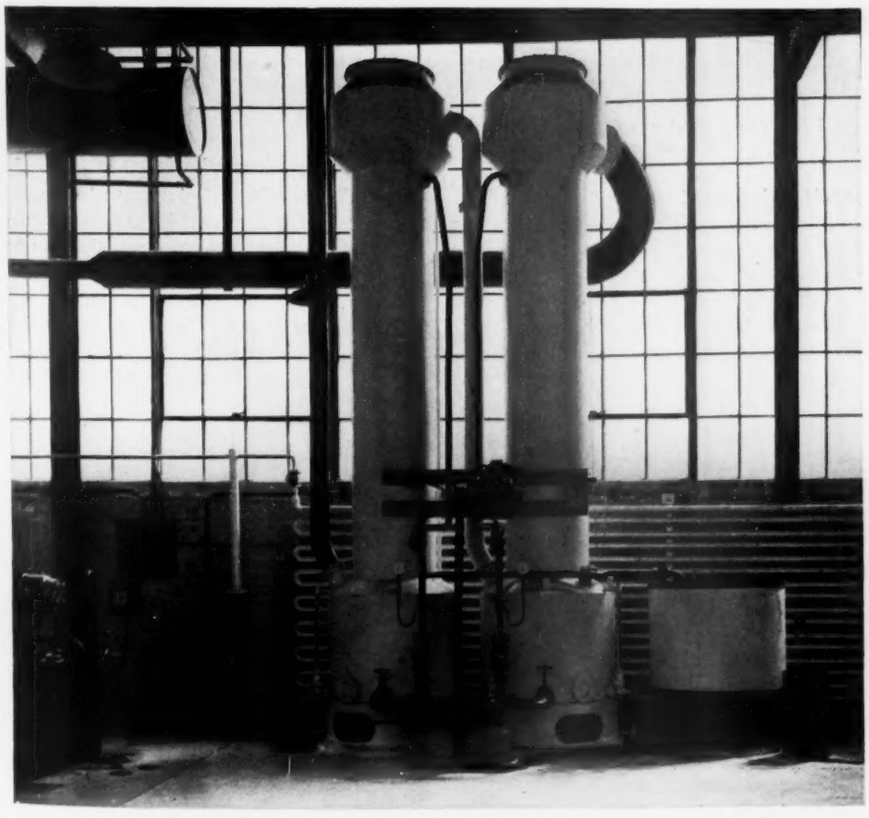
The compressor is driven by a General Electric 100-hp. motor with a short belt drive using a Lenix belt tightener.

After entering the compressor the air is successively boosted in four stages to the normal operating pressure of 200 atm.

All cylinders are water-jacketed for the removal of heat generated by compression and additional efficient cooling follows each stage of compression. When the air leaves each of the first three cylinders in order it passes through an inter-cooler before going into the next cylinder for further compression. The inter-cooler between the first and second stages is mounted on the compressor directly over the cylinders. The remaining two inter-coolers and the after cooler, which removes the heat of the fourth and last stage of compression, are pipe coils submerged in a tank located directly under the overhanging cylinders. The air leaves the compressor at practically the temperature of the incoming cooling water.



Liquefaction column in center. High pressure compressor at right forces air to expansion valve in column



Air purifying towers. Caustic potash solution tank at right. Circulating pump mounted on towers

Drying Battery

The highly compressed air passing from the last stage of compression streams through the oil purging flask (F) and by the force of impact in this cylinder, oil mist and much of the moisture in suspension is precipitated to the bottom of the cylinder. The residue is removed through a blow-off valve at the bottom of the flask at regular intervals.

After passing through the oil purging flask the air continues on into the drying battery (G), where the remaining moisture and any traces of carbon dioxide is removed.

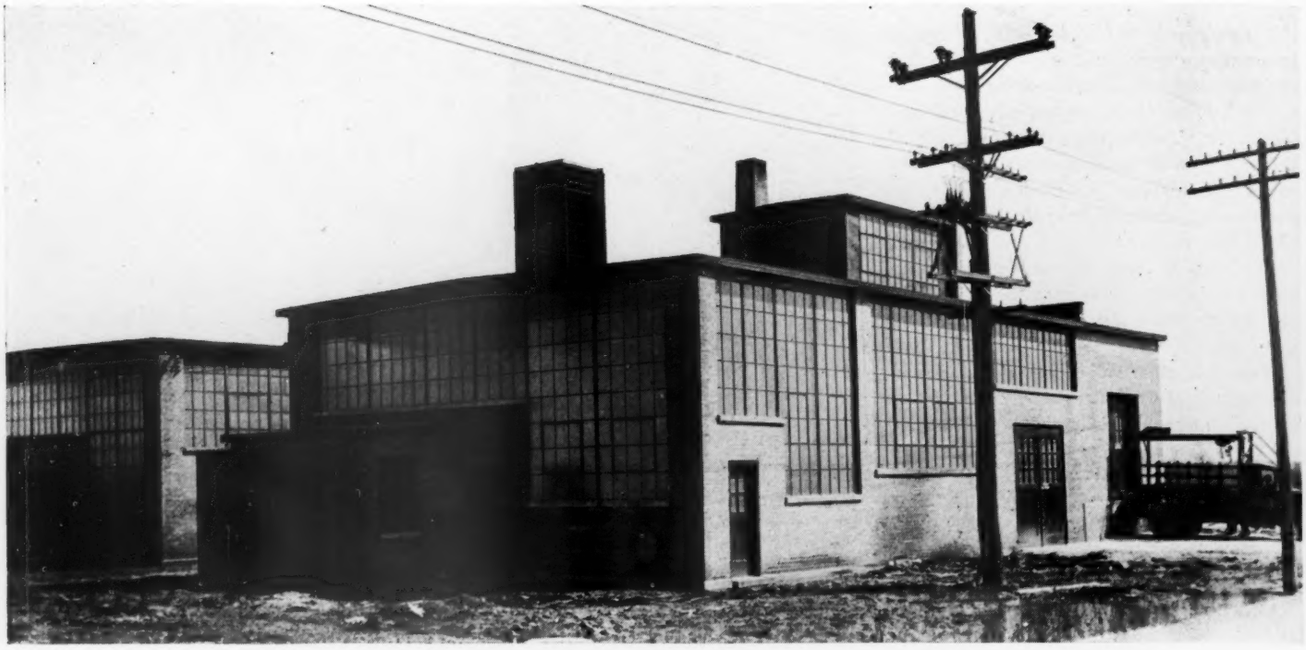
The drying battery, which is in duplicate, consists of six cylinders, three of which are used at a time, each equipped with a blow-off valve for removing the absorbed moisture.

Three cylinders charged with dry caustic potash, about the size of a walnut, are in use at one time. The air passing from bottom to top of each cylinder, through the dry caustic potash, is dried and cleansed by the action of the chemical. Cotton batting in the top of each cylinder acts as a filter to catch solid particles.

The drying battery being in duplicate, allows the replacement of spent charges in three of the cylinders without interruption to the process.

Liquefaction Column

From the drying battery the air passes through the high pressure filter (H), where any mechanically carried particles are



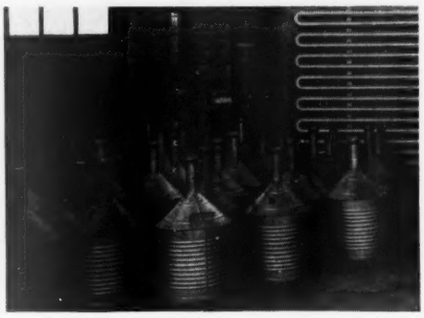
Liquefaction department of the Loxite plant. Nitrogen vent in center of picture above roof

dropped out of the air supply.

The dry purified air is now split into two parts, one part going through an expansion engine and from this expansion engine through a heat exchanger into the liquefaction and rectification part of the column. The other portion of the air goes direct through a heat exchanger to an expansion valve where the pressure is dropped from 200 atm. down to approximately .3 of an atm. These two portions of air are now re-combined in the same liquefaction and rectification chamber.

The liquid air produced by these two expansions trickles down over a series of baffle plates and becomes separated by a process of rectification and distillation into liquid oxygen at a purity of 99.5% and an impure nitrogen.

A storage container for storing liquid oxygen is set adjacent to the liquefaction column. This storage container has a capacity of approximately 500 gallons and is made of brass and copper.



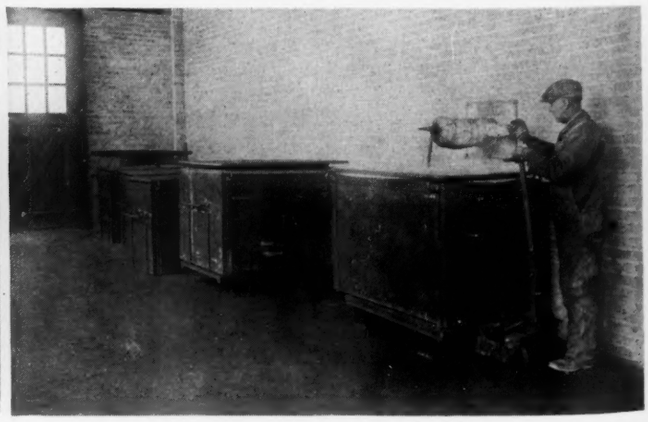
Thermos containers for transporting liquid oxygen

The liquid oxygen which is produced and drawn off into the storage container is at a temperature of —183 deg. C. It has a light blue color. When the liquid oxygen is drawn off into any ordinary pail or receptacle there is a vigorous boiling which is caused by the difference in temperature. When poured into water a dense vapor arises from the surface of the water and continues until the liquid oxygen has entirely evaporated. Liquid oxygen increases the speed of combustion so much that an ordinary match thrown into a receptacle of liquid oxygen will burn with an intense white flame. In handling liquid oxygen in an ordinary container which is not insulated, care must be taken not to touch the container with the bare hand, as the very low temperature will produce quick freezing. With ordinary care and perfect understanding of the properties of liquid oxygen it may be safely handled.

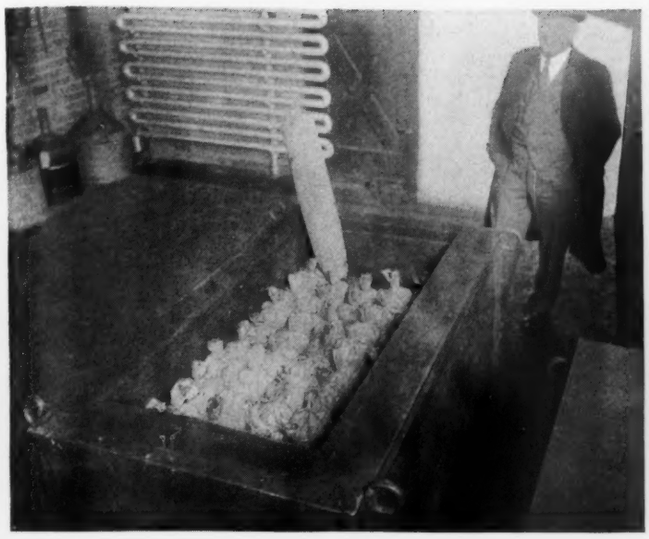
In the cartridge department the proper mixing of the dry ingredients for the cartridge filler is carried on. Cartridges can be so prepared that they will produce the desired explosive effect. By proper control of the cartridge, small or large, dry or wet holes can be successfully blasted.

The filling, in proper proportions for the

Cartridge containers in charging department



Charging cartridge container from liquid oxygen supply line



Cartridge container, showing how cartridges are packed for saturating

Truck equipped with revolving body, and supported trolley track for handling containers

type of material to be shot, or the condition under which cartridge will be used, is mixed in a special machine. This mixture is fed into the hopper of a filling machine. From this filling machine cartridges of the dimensions required in usual practice are filled.

The uniform results of this cartridge and the explosive control claimed by the Loxite Co. is due to scientific and absolute uniform mixing of the filler and care in making.

Impregnating or Saturating

This is the last process in the preparation of the explosive. To saturate and transport the finished cartridge, a non-ferrous lined container of the required size to accommodate a specific number of cartridges, usually 50 at one time, is used. The container is a double box construction, the bottom and wall spaces being thoroughly insulated with suitable insulating material and fitted with a top similarly insulated, with beveled edges, forming practically an air tight seal when in place.

The dry cartridges are packed into the container in the cartridge room and then taken into the saturating room, placed under

A blast of liquid oxygen explosive in the quarry of Dolese and Shepard, Hodgkins, Ill.

Loading holes with Loxite. The first cartridge is lowered on a string and others dropped into place

Handling of saturated cartridge from container preparatory to loading holes

a gate valve controlled filling line from the liquid oxygen container in the liquefication room. A bronze extension filler is placed in the opening, in the top of the container, and attached to the liquid oxygen line by means of a compression screw. The gate valve in the liquid oxygen line is opened and the liquid flows into the container, under light pressure, submerging the cartridges and saturating them completely. When the cartridges have become thoroughly saturated the valve is closed, the filler pipe removed and the containers ready to be transferred to the point where the cartridges are to be used. The saturated cartridge is easily and safely handled.

For transporting the containers and cartridges the Loxite Co. has a Reo-Speed wagon having a revolving body and equipped with a heavy I-beam trolley track supported by steel uprights, carrying a trolley and chain block for handling the containers on and off the truck. All joints and connections in the construction of the I-beam track and the supporting framework are welded. After loading a container or containers, to be transported, the truck leaves the plant for its destination. Arriving at a point in a quarry where the containers are to be unloaded it is not necessary to back around in

View of quarry face after blast of Loxite. Perfect shattering was accomplished

Blast hole loaded with Loxite and water boiling out at the top

order to get the end of the truck in an easy position to unload the container into a car or on the ground, as the case may be. By merely rotating the truck body an advantageous unloading position is obtained, the chain fall is attached to a specially designed spreader hook which engages a lifting ring at each corner of the container, raises it from the floor and carries it out clear of the truck body on a hinged extension of the I-beam track and lands it at any desired point.

At the Dolese and Shepard Co. quarry the container had been taken to the location of the blast holes to be loaded, in a wagon.

In this particular shot there were twelve holes 26 ft. deep and from 18 to 22 ft. of water in each.

A "face" shot approximately 150 ft. long was laid out, and 6-in. holes drilled using an electrically driven Keystone well drill.

As the loading of the holes with Loxite cartridges proceeded, the wagon pulled up to each hole. The number of cartridges which were to be loaded in the hole were removed from the container and placed in an ordinary square wooden box with extended handles and carried to the hole and dumped on the ground close to it that time will be saved in loading.

Left to right, L. M. Zimmer, Loxite Co.; W. H. Schuett, pit foreman; J. I. Banash, consulting engineer, and T. W. Jones, superintendent

In loading, the first or bottom cartridge is lowered into the blast hole using a light line with a shallow throat hook attached, the hook is placed in the loop of the wire which ties the top of the cartridge and when the cartridge has been landed at the bottom of the hole a slight slackening of the line and a quick upward movement frees the hook from the loop. This method of placing the first cartridge is desirable to prevent the lodgement of the cartridge on any "springing" which might have occurred between the time the drilling had been completed and the time of loading.

After the first cartridge has been lowered into place and it is certain there is nothing projecting into the blast hole, the remaining cartridges of the load are dropped into place and lightly tamped. The cartridges were weighted at the bottom so that they would sink more rapidly in the water.

As the water came to the top of the blast hole, displaced by the cartridges, there was a violent boiling due to the difference of temperature of the liquid oxygen and the water, which continued until the stemming was placed and tamped.

The loading of the blast holes was accomplished in a short time, the loading of the 12 holes taking 56 minutes from the time the first cartridge was placed until ready to fire.

Cordeau - Bickford detonating fuse and a regular blasting machine was used.

The effect of the shot was all that could be desired. The shattering of the material moved was so far as could be seen very well accomplished and from the appearances it looked as if the steam shovel would have an easy time cleaning up. Some idea of the section moved and the shattering may be had from the accompanying illustrations.

At the moment of the actual explosion the sensation was that of a sharp, severe crack, the rumbling viobrating effect noticeable at the time of the usual explosion was not felt.

In placing this shot, calculations had been made in advance to move the face out about 40 to 50 ft. so as not to cover the electrically equipped haulage track in the quarry bottom. After the blast it was interesting to note that very little rock had been blown onto the track, in fact, what had been placed there could be removed by two men in a few minutes.

Result of blast using Loxite explosive. A good view of the face and shattering of material moved

Bottom Shot

The "bottom" shot witnessed was at the quarry of the Peoples Crushed Stone Co. (a subsidiary of the Materials Service Corp.), located near La Grange, Ill.

Here the cartridge containers had been delivered at the top of the quarry at the incline. Convenient carrying boxes were filled with the saturated cartridges from the container and placed on a car having a platform body. The car loaded with the boxes was lowered down the incline into the quarry and stopped near the point where the blast holes had been drilled. The depth of these holes were 36 ft. and were loaded in the same manner as previously described, and stone screenings used for stemming.

Slow burning fuse was used. The blast holes here were also 6-in. bores slightly staggered to follow the contour of the base

Body of material lifted out from face showing fragmentation

The result of this blast was such that easy clean-up will be possible

of the quarry wall.

At the time of the blast little or no stone was thrown out of the quarry. The fracture of the floor was somewhat irregular and apparently satisfactroy.

The track immediately in front of the blast was raised up and shoved over bodily, but it was not broken at any point and with but a little lining and tamping would be available for use.

Material Well Shattered

In this case also the shattering was noticeable, as there were only a few large pieces of stone to be seen as the result of the blast.

In both cases the appearances indicate that a steam shovel could clean up with speed and ease.

In the latter case the detonation and vibration was less noticeable, probably on account of the depth of the quarry floor.

The Loxite Co. plant, situated as it is, is

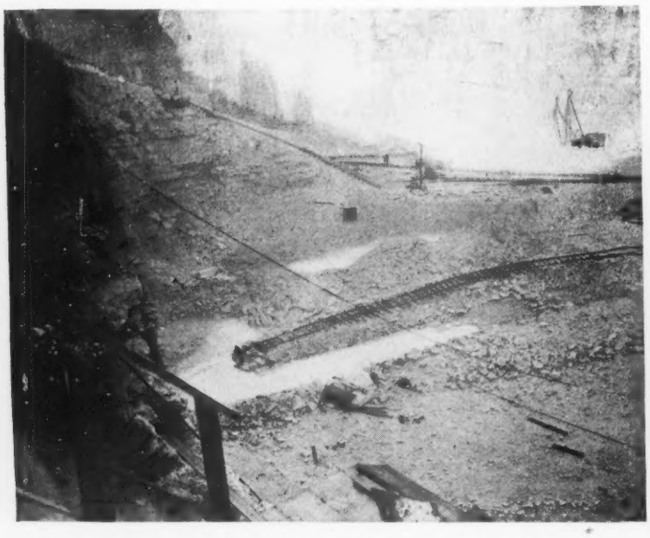
Cartridges in boxes loaded onto platform car. Oxygen vapor is seen above the boxes

able and equipped to furnish Loxite explosives to quarries over a considerable territory in and about Chicago.

Where the consumption of explosives is large enough in one or more open pit quarrying or mining operations, in an area of 100 miles, the Keith-Dunham Co. will contract to erect and operate one or more of its Loxite plants and to supply the necessary explosives.

Where the individual requirements are sufficiently large to warrant a large consumer of explosives doing so, the Keith-Dunham Co. will sell the necessary equipment outright and arrange to supply suitable cartridges.

The Loxite explosive is sold on the cartridge basis, according to the size desired. They vary from 1 to 5-in. in diameter and various lengths. The cartridge used in gen-



Bottom of quarry before shot. After the blast the water disappeared

An "action" view of a blast at the Peoples Crushed Stone Co. quarry near La Grange, Ill.

Bottom shot showing irregular crack and track moved out

eral practice are 5-in in diameter and 24 to 35-in. long. Except in cases where high power rates and labor costs prevail the price of this size cartridge is approximately $2.50 each.

William E. Carson in the Limelight

WILLIAM E. CARSON, president of the Riverton Lime Co., Riverton, Va., for many years president of the National Lime Association, and as such compiler and publisher of "Limelight"—the first volume of the association's transactions—is now "in the limelight" himself. According to newspapers published Saturday, April 6, Mr. Carson was President Hoover's host on the occasion of his fishing excursion in the proposed Shenandoah national park. Mr. Carson is said to have much of the President's proposed fishing preserve under lease.

International First-Aid and Mine Rescue Contest To Be Held in September

THE EIGHTH INTERNATIONAL First-Aid and Mine-Rescue Contest will be held in Kansas City, Mo., September 12, 13 and 14, 1929, it was announced by the Department of Commerce recently. An invitation to hold the contest in Kansas City was extended to Scott Turner, director of the United States Bureau of Mines, by Hon. Albert I. Beach, mayor of that city. The invitation was given jointly by the Convention Bureau of the Chamber of Commerce of Kansas City; the Kansas City Safety Council; the Arkansas-Oklahoma Coal Institute; the Southwestern Coal Operators' Association; and Districts 14, 21 and 25 of the United Mine Workers of America. The contest will be staged in Convention Hall.

The International First-Aid and Mine-Rescue Contests are held each year under the auspices of the Bureau of Mines, with the co-operation of the National Safety Council, the American National Red Cross, and various mine operators' associations and miners' organizations. Employes of mines, quarries and metallurgical plants, and workers in the oil and gas industries are eligible to participate in the contest. Nearly 300,000 workers in the different mineral industries have been trained in first-aid or mine-rescue methods by the Bureau of Mines. Features of the meet will be the awarding of the Congressional medallions, given annually to the teams of miners adjudged most thoroughly skilled in first-aid and mine-rescue methods and the assigning of various cups and trophies to winning teams from certain specified districts.

Each first-aid team is required to perform certain definite problems in first-aid practice, calling for the treatment of injuries and proper handling of a "patient." The mine-rescue teams, provided with oxygen breathing apparatus and other necessary equipment used by rescue crews in coal and metal mines, work out practical problems such as are likely to be encountered in underground rescue and fire-fighting work.

Wisconsin County Cement Bids

THE BIDS of thirteen cement firms on nineteen highway projects, all at the same price, were ordered reported to the five counties affected, Clark, Richland, Sheboygan, Rock and Winnebago, by the Wisconsin state highway commission in session recently. W. C. Buetow, state highway engineer, was instructed to ask the counties if they wished to buy the cement at the prices quoted.

The thirteen bidders, all submitting the same price per barrel, except for the difference in freight rates and a five-cent difference in base price which is higher in the Duluth area than in the Buffington, Ind., area, are:

Universal Portland Cement Co., Chicago; Alpha Portland Cement Co., Chicago; Marquette Cement Manufacturing Co., Chicago; Sandusky Cement Co., Chicago; Lehigh Portland Cement Co., Chicago; Northwestern States Portland Cement Co., Mason City, Iowa; Manitowoc Portland Cement Co., Manitowoc; Atlas Portland Cement Co., Chicago; Petoskey Portland Cement Co., Petoskey, Mich.; Western Lime and Cement Co., Milwaukee; Cutler Magner Co., Duluth, Minn.; Dewey Portland Cement Co., Davenport, Iowa, and Newaygo Portland Cement Co., Newaygo, Mich.

Beloit, which has the lowest freight rate of any delivery point affected by the projects covered in the bids, is quoted a price of $2.60 a barrel less 20 cents discount and 40 cents for sacks returned. Loyal, in Clark county, which comes in the Duluth area, where the base price is five cents higher, and also having the highest freight rate of any of the delivery points, is quoted a price of $2.75 a barrel.—*Madison* (Wis.) *Times.*

Richard K. Mead Son Killed in Motor Accident

ON HIS WAY to a prom at Princeton, University, March 15, Francis A. Meade, 21, of Roland Park, Baltimore, Md., a senior at the university, was fatally injured when his automobile collided with a truck, the driver of which is said to have been intoxicated. Mr. Meade was an only son of Richard K. Meade, Baltimore, Md., consulting engineer and chemist for the portland cement, lime and gypsum industries.

Sound Aggregate Not the General Rule

SIR: I must take issue with your reporter who has given the impression in his article on the American Concrete Institute proceedings (March 2 issue of ROCK PRODUCTS) that I assume that a sound aggregate is the general rule. In my paper I specifically mention that "in order to keep to a reasonable length and to emphasize the points that the author wishes to bring out, the paper will only consider those defects that have their origin in the proportioning, mixing, placing and curing of the concrete." In the paper I presented before the Engineering Institute of Canada a year ago, I discussed the question of aggregates as one of the factors that affect the durability of concrete. I have given this phase of the problem considerable study, and seen many failures where aggregates were the primary cause, or were at least in a great degree responsible. I certainly do not hold the beliefs that your reporter implied.

R. B. YOUNG, Testing Engineer,
Hydro-Electric Power Commission of Ontario.

Toronto, Ont.,
March 16, 1929.

Oklahoma Agitating a State Cement Plant

AN APPROPRIATION of $1,000,000 for establishment of a state-owned cement plant and creation of a board of control of three members to handle the business of the plant would be provided by a bill introduced in the Oklahoma house of representatives recently by Walter E. Jacobs of Coalgate.

In the bill by Representative Jacobs, the board of control for the cement plant would consist of one member appointed by the state senate, one by the house of representatives and one appointed by the governor with the consent of the senate.

The members would hold office for four years and would draw pay at the rate of $10 a day while actually engaged in duties in connection with handling affairs of the plant.

The board would have authority to employ a superintendent who would serve at a salary of not to exceed $10,000 a year. The cement required by the state in its public roads and buildings would be supplied by the state plant at actual cost of production.

Convict labor would be provided in the cement plant at a wage of 50 cents daily, half of which would go to dependents of the convicts concerned.—*Oklahoma City* (Okla.) *Oklahoman.*

Workers at Cement Plant Elect Their Safety "Police" Officials

THE AVERAGE WORKER at the Marquette cement plant in South Cape Girardeau probably went about his tasks today with a more careful step, a wary eye for the police and a fearful feeling that he might be hailed before Judge R. C. Matthews to answer charges of something or other.

Employes held an election the other day and selected "police" to see that safety regulations are observed by all the workers, and unenviable is the lot of the individual who has a "run-in" with the officers and is arraigned before "Judge" Matthews, plant superintendent, to explain why he violated the "laws" prescribed to make his job as safe as possible.

Workers in the mill division of the plant will keep a lookout for John K. Ramey, whose tenure of office as "chief of police" will last the next three months, while those in the quarry part will be under the observation of Raymond Ford, who was elected safety chief of that part of the plant. The two chiefs will be supervised by Manning P. Greer, safety engineer for the company.

Mr. Ramey won out in the election by a scant margin of five votes, polling 79 to 74 cast for W. P. Yow and 32 for James Brown. Ford had it easier in his part of the plant, receiving 44 votes compared to 13 for O. W. Stallion. In view of the almost. if not quite, 100% polled, it was gathered that the cement workers "stand for law and order" as far as safety is concerned.—*Cape Girardeau* (Mo.) *Missourian.*

Florida Land Purchased by Phosphate Firm

PURCHASE by the American Cyanamid Co., Niagara Falls, N. Y., of more than 500 acres of phosphate land 13 miles from Plant City, Fla., was announced recently by the company. The company manufactures fertilizers and heavy chemicals and now operates large phosphate mines near Brewster, Fla., 20 miles from the newly acquired holdings. Plans are being made to start working the deposits this year, it was said. The purchase price was not given.

Wisconsin Trucking Contractors Ask Higher Rates—Recent Gravel Bids

AN ADVANCE of 5 cents per cubic yard for every mile of haul for gravel used on roads was asked by private truck owners in a conference with road contractors in Janesville, Wis., recently, when they appeared unexpectedly at the first letting of gravel road bids by the county highway committee. They asked permission to make their claims to the contractors when the latter assembled to enter bids on road work, but were ruled out on this by county officials, and then presented the matter quietly in conferences with the contractors held in the corridors of the court house.

Truck drivers recently held a meeting at which they discussed their problems and came to an understanding on prices for hauling. They have received 20 cents per cubic yard for the first mile and 15 cents for each mile after the first. Their present demand is for 25 cents for the first mile and 20 cents for each mile thereafter.

More than 50 were present for the opening letting of road bids, including practically all of the gravel contractors in the county, several check men and other county road officials, and the delegation of truck owners.

Prices on the work on three jobs upon which bids were called ranged from 75 cents to $1.35 a yard. But five contractors bid on the jobs. The bids per cubic yard for gravel on the job were as follows:

Old highway 20, three miles of resurfacing from the Brown corner south on the Magnolia-Evansville road, 800 yards, A. C. Parker, Brodhead, $1.15 per yard; Drew and Garey, Evansville, 97½ cents; William Drew, Footville, $1.04; Kennedy Brothers, Footville, 96 cents.

Highway 92, four miles of resurfacing from the relocation west to Sissons Corner, 1,800 yards, Parker, $1.35; Drew and Garey, $1.30; William Drew, $1.34; Kennedy Brothers, $1.26.

Magnolia-Evansville road, three miles of resurfacing from Brown corner south, 1,800 yards, Parker, $1.14; Kennedy Brothers, 86 cents; Drew and Garey, 83; William Drew, 89; and Harold Burtness, Orfordville, 75 cents.—*Janesville* (Wis.) *Gazette.*

Iowa Gravel Producer Buys a Quarry

THE L. G. EVERIST CO., INC., Sioux City, Ia., has purchased what is known as the Simpson stone quarry in the east part of Dell Rapids, S. D.

About two years ago the Sioux City company leased the quarry for two years, with the privilege of buying it at any time within the two years. The time expired the last of March. The quarry is a good one and the Sioux City company has been shipping a lot of granite since leasing the quarry. Now, through the purchase, the company will have permanent control of the quarry.

During the past two years the company has made a number of improvements, including the installing of new quarrying machinery and repairing the buildings. The company announces it expects to employ a large number of men this summer. The quarrying operations of the company will be materially expanded.—*Sioux Falls* (S. D.) *Argus-Leader.*

Marion Sand and Gravel Company Expands

THE MARION SAND AND GRAVEL CO., Marion, Ohio, has purchased the plant and business of the Richwood Gravel and Stone Co., located at Richwood, Ohio. The transfer took place early in March, 1929.

The additional plant will provide the Marion company with production which has been urgently needed on account of increasing business.

The Richwood plant has been operated by a partnership headed by J. S. Kagay, of Richwood. Mr. Kagay expects to give his attention to his real estate interests in the future.

Both the Marion plant and the Richwood plant of the Marion Sand and Gravel Co. are located on the Erie railroad, the Richwood plant being about 15 miles southwest of Marion. The territory served by the Marion Sand and Gravel Co. extends east to Mansfield, west to Lima, north to Fostoria and south to Columbus. Prospects for business in this territory this season are exceptionally good, according to officials of the company. The officers of the Marion Sand and Gravel Co. are: L. K. Warner, president; W. H. Symes, secretary-treasurer. The offices of the company are located in the Citizens building of Marion, Ohio.

Australian Sand Plant Produces Ideal Material Without Washing or Screening

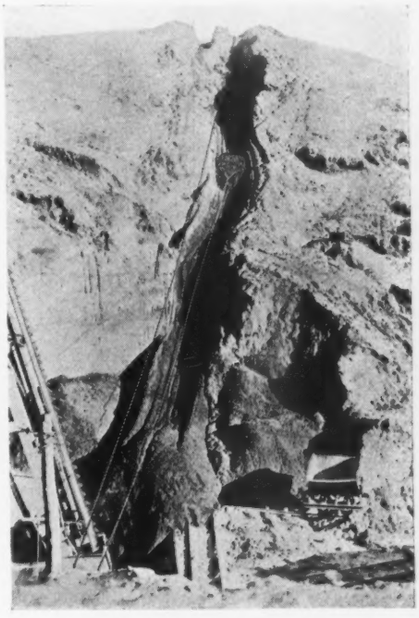
THE NOARLUNGA SAND CO., LTD., Adelaide, South Australia, was organized in 1926, and early in 1928 began operation of a sand plant on the sea coast near the town of Noarlunga, some 20 miles south of Adelaide. The plant was designed by the company's consulting engineer, J. J. Grierson, M. A. I. M. M., of Seacliffe, Adelaide, who was also responsible for the construction of the plant and installation of equipment.

The ropeway from the storage bin at the pit to the railroad loading station. The angle station is shown at the right

At Noarlunga the company has an extensive deposit which has been proved by close boring to be at least three-quarters of a mile wide. It is an ancient river bed, and has no connection with the recent sands along the sea coast. Owing to its age, it is free from all organic matter. Only small quantities of gravel occur in the deposit (approximately 1%). The sand is constituted entirely of quartz grains; according to Mr. Grierson it is very evenly graded in its natural state, remarkably uniform in quality, and an ideal material for concrete and other building purposes.

Due to the natural conditions existing, the plant includes no provision for washing or screening, and the operation consists of dragging the sand from the pit to a storage bin feeding an aerial ropeway by which the material is carried to a loading bin on the railroad. Most of the product is shipped into Adelaide for local construction work.

The deposit is covered with an overburden varying from nothing up to about 8 ft. Below that, the height of the face of the sand varies from 50 to 80 ft. Under the method adopted, the loading bin for the aerial tramway is set on the floor of the pit, in an excavation in the middle of the deposit, and the sand is dragged down from the surrounding banks to this hopper. The excavator employed is a Sauerman "Crescent" ¾-cu. yd. power drag scraper, installed on a span of 500 ft., and from the present setting of the plant it is intended to excavate an area within a 500-ft. radius on all sides of the loading bins. The plant is designed for a capacity of 45 tons an hour, which Mr. Grierson says it has no difficulty in producing.



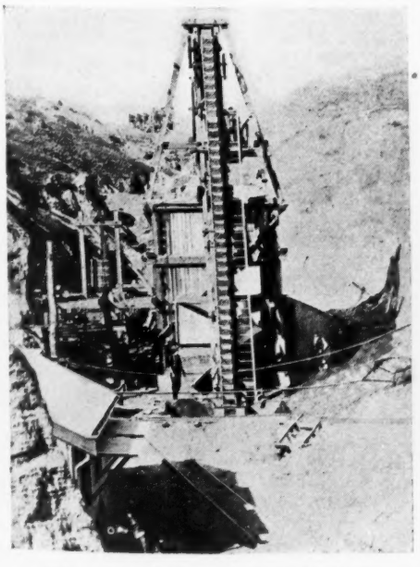
Scraper bucket bringing sand from pit

The power scraper discharges into the boot of a bucket elevator which lifts the sand to the loading bin of 100 tons storage capacity. Discharge gates of this bin feed the sand direct into buckets on the loading terminal of the aerial ropeway, which in turn carries the sand to the railroad loading station, 1¼ miles distant. The buckets on the tramway rise up a 25% grade and pass around an automatic angle station, then over undulating country to the railroad bin. The buckets tip automatically, and return to their loading station upside down.

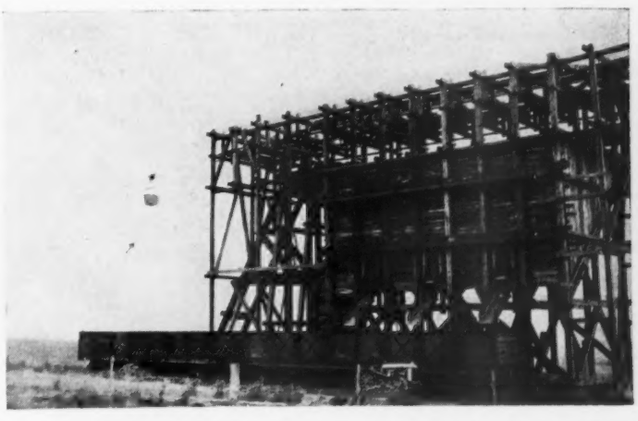
The loading bin at the railroad has storage capacity of 400 tons and is equipped with gates on one side for the loading of 40-ton gondola cars, and gates on the other side for loading motor trucks. The company's railway siding is so graded that all of the shunting of cars is carried out with a standard Fordson tractor. Only one man is employed at this end, and he does all of the spotting and shunting of cars, loading, consigning, etc.

The sand deposit is opening up well, and there is good demand for the product. The enginer, Mr. Grierson, writes that the layout adopted is efficient and entirely satisfactory.

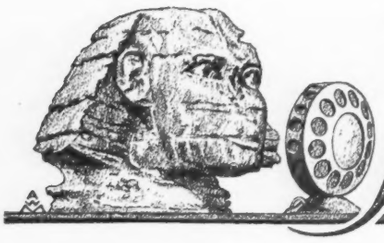
The directors of the Noarlunga Sand Co. are P. J. A. Lawrence, chairman, F. G. Scarfe, E. J. Hume and F. S. Scholefield, A. M. I. E. The secretary is A. E. H. Evans, who is in charge of operations.



The bucket elevator to which the scraper bucket discharges



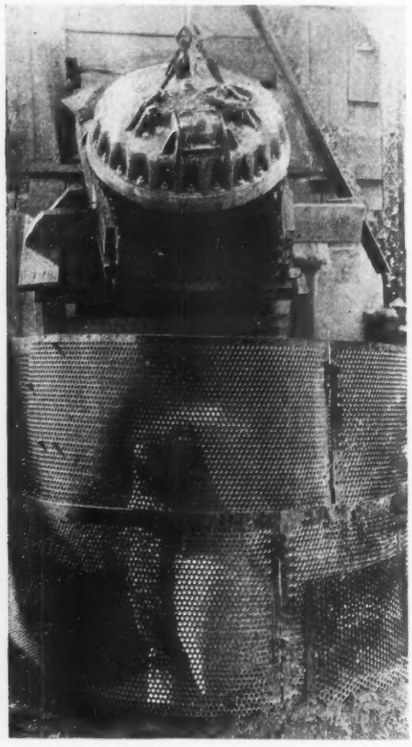
The railroad terminal of the ropeway, showing the loading bins. The tractor is shown switching cars for loading



Hints and Helps for Superintendents

Stationary Magnet Used in Crushing Practice

TRAMP iron has ever been a menace to machinery no less so to large crushers than other machinery. The plant of the Weston-Brooker Co. has been no exception to this and recently suffered the breaking of one of the main crusher castings due to tramp iron.



Electric magnet above the chute to the secondary crusher removes tramp iron. The old screen plates in the foreground protect men from flying stone

The illustration shows one method of protecting the secondary crusher from material of this nature, suspending above the feed spout an ordinary lifting magnet. The illustration also shows one method of protecting their operators from flying bits of stone at the crusher.

The plant of the Weston-Brooker Co. is located on the outskirts of Columbia, S. C., and many ingenious devices which have originated in this plant have become more or less of general use in the crushed stone industry throughout that section.

Just a Moment—

"A MAN'S JOB is his best friend. It clothes and feeds his wife and children, pays the rent and supplies them with the wherewithal to develop and become cultivated. The least a man can do in return is to love his job. A man's job is grateful. It is like a little garden that thrives on love. It will one day flower into fruit worth while, for him and his to enjoy."—Arthur Capper.

Classifier Used to Store Sand

THE USE of cones and similar devices for storing sand is rather an old story, but mechanical classifiers have been little used for the purpose. However, the *Engineering and Mining Journal* of January 2 describes such an installation at the Old Dominion mine, Globe, Ariz., which is working very successfully. Two 4-ft. 6 in. Dorr classifiers are used. They are mounted on a steel carriage which is equipped with car wheels that run on a track laid on top of the sand that is stored. This is possible because the classifier can deliver sufficiently far ahead to build up sand to support the track. The track is in sections 22 ft. long of 30-lb. rail, spiked to 4 x 6-in. stringers.

The sand which is drawn out by the rakes of the classifiers is discharged into a spout which can be turned so that the sand may be placed at the sides as well as in front. It contains about 30% moisture, and it will run on a grade sufficiently flat for the purpose. With one setting the bank may be built out 25 ft. ahead and 30 ft. wide at the top.

The classifier is fed through an 8-in. pipe line by a 6-in. Wilfley centrifugal pump. An armored suction hose is attached at the classifier end to take care of misalignment and render the moving easier.

The sand is rather finer (4% on 35-mesh and 12.6% through 200-mesh) than would be produced in a commercial sand plant, but there is no reason why the method should not work just as well with coarser sands. The feed to the Wilfley pump contains 19.2% of solids, as an average.

The cost is stated to be $0.027 per ton of ore treated. It would be greater per ton of sand stored as only part of the crushed ore is as coarse as sand. The remainder is "slimes," clayey matters and very fine sand and this is impounded in the dam that is formed by storing the sand as described above. The clear water overflow from the pond formed in this way is returned to the plant for re-use.

Tilting Table for Dumping Stone

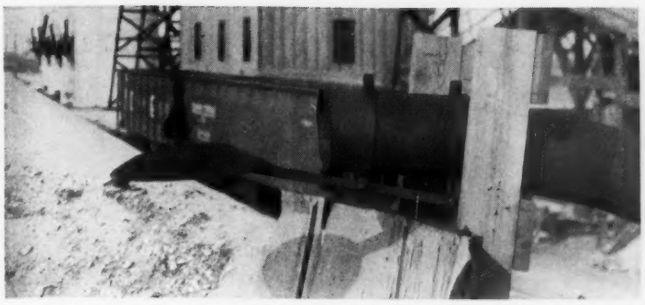
THE methods of unloading stone from cars and skips into primary crushers are many and varied.

At a plant recently visited two crushers are used for primary breaking and the rock is delivered to these units by one of three inclines. Two of the inclines are so located that the cars are end dumped automatically by the hoist operator without unnecessary delay or inconvenience.

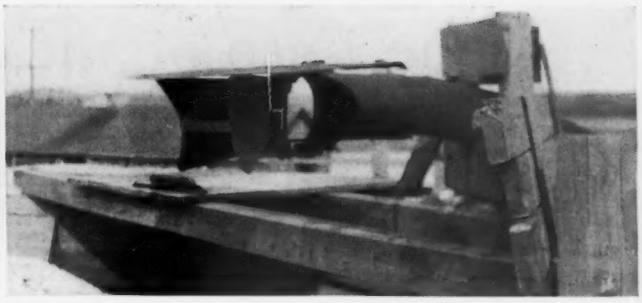
Tilting section of track at the primary crusher dumps the quarry cars

At the head of each incline there is a tilting table which is a part of the track and on to which the car is pulled by the hoistman. At the same time lugs on the door proper engage two upward slanting rails which open the end door and as the front end of the car tips forward and down, due to the action of the tilting table, the door is opened to the maximum and the contents of the car is discharged into the crusher.

This ingenious arrangement was developed by the staff of the Raleigh Granite Co. at their Rolesville plant, Wake Forest, N. C.



An adjustable disk at the end of the pipe spreads the discharge to the sump



Another type of deflector for pipe discharge made of sheet metal pieces

Chart for Calculating Concrete Cost Per Cubic Yard

By CHARLES M. BULL

Mobile, Ala.

(From *Engineering News-Record*)

THE accompanying chart offers a graphical determination of the cost of materials in a cubic yard of concrete of various mixes and with a variety of individual material prices. Its use is as follows:

In the problems shown, the price of cement is assumed at $2.30 per bbl., sand at $2.25 per cu. yd. and gravel at $2.60 per cu. yd. Required the material cost of a cubic yard of 1:2:4 concrete. Start at 2.30 in the 1:2:4 column at the right side of the diagram, follow horizontally to the left until intersecting the 2.25 diagonal line representing sand, then follow vertically until the 2.60 line diagonal representing gravel is intersected. From this point follow horizontally to the left to the 1:2:4 column on that side of the diagram. The intersection with this column gives the material cost per unit yard of 1:2:4 concrete, which in this case is $6.32. Similarly, using the same material prices, we find a cubic yard of 1:2½:5 concrete to cost $6.05.

Spreading a Pipeline Discharge

IN discharging sand and gravel from a dredge pipe line to a sump, it has been found objectionable to have the discharge flow concentrated at one particular point in the sump. To get around this difficulty the Morton Sand and Gravel Co. has been experimenting with various types of discharge deflection and spreaders at its plant near Wayne, Ill. Two sumps are being operated at the plant and the discharge line to each sump has been fitted up with a special spreader for experimental purposes.

One spreader consists of a convex disk held in front of the end of the pipe line by an steel arm, as shown in one of the illustrations. The arm is held by two collars about the pipe, the second of which is fitted with a vertical slot to permit raising or lowering of the disk. The disk can also be adjusted horizontally by moving the collars backward or forward. The pipe line discharge striking the convex surface of the disk is immediately spread out.

The second deflector is built up of sheet metal plates bent to the shape shown in the illustration. This arrangement spreads the discharge well out to the two sides but does not divert it as easily or as well as does the disk arrangement described above.

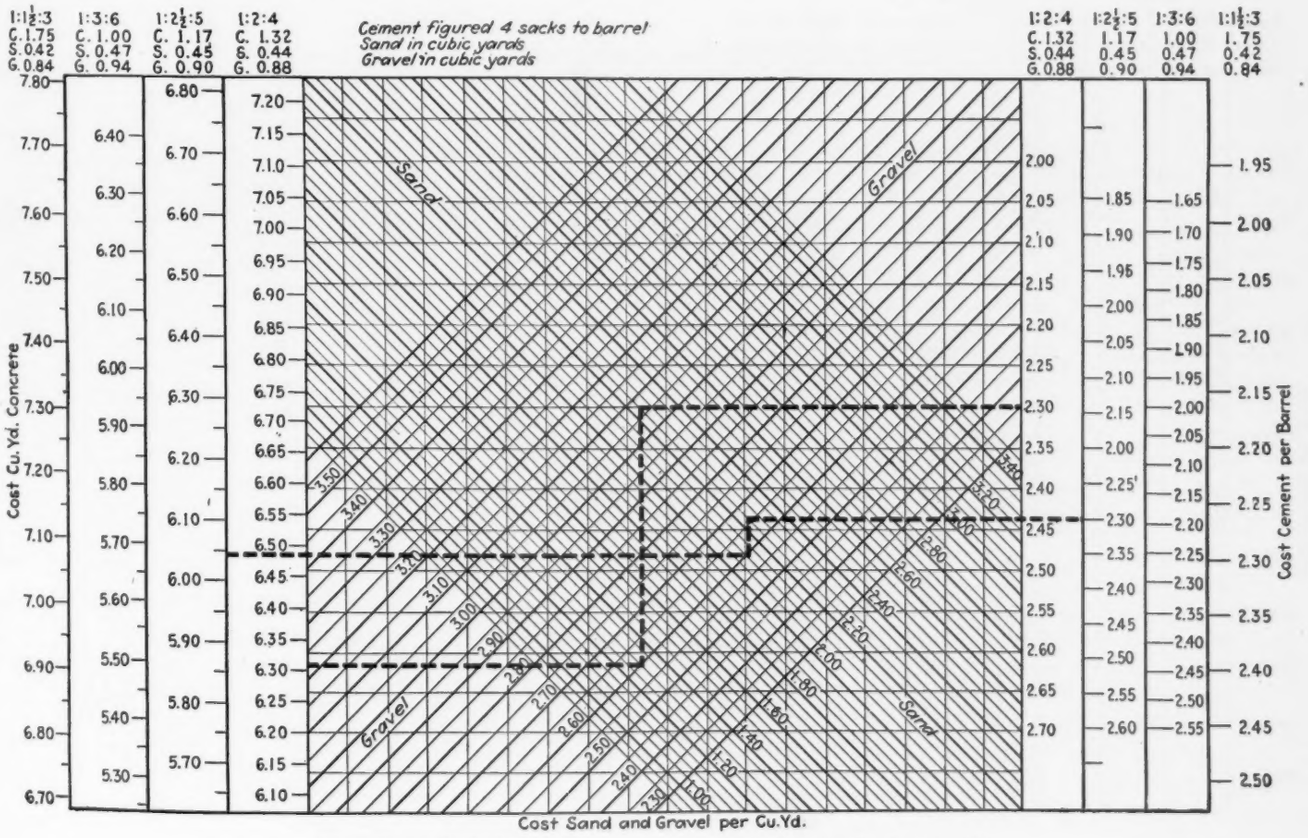


Chart for calculating the material cost per cubic yard of concrete

The Case of the Portland Cement Manufacturers for a Protective Tariff

THE FACTS AND FIGURES presented in exhaustive detail to the committee on ways and means by American cement manufacturers include the following:

The American portland cement industry comprises 157 plants owned by 94 independent companies paying annually more than $53,000,000 to its 36,292 wage-earners and contributing to the wage payments of industries from which it obtains its principal supplies (coal, etc.) about $70,000,000, thus indirectly supporting 47,624 additional wage-earners (figures for 1927).

The urgent necessity for restoration of a tariff to protect the industry results from the following:

(1) From 1923 to 1928, 14,905,000 bbl. of foreign cement were brought into the seaboard markets of the United States—more than 65% of it from Belgium and paying no duty.

(2) The delivered costs of foreign cement in American seaboard markets range from 38 cents to $1.16 a barrel less than American delivered costs in those markets. "Direct labor represents 31.4% of American manufacturing costs; and this with the indirect labor paid for supplies, equipment, building, etc., represents a very large part of the total cost of the product. The American cement manufacturer pays labor 4.3 times as much per hour as the Belgian manufacturer." In 1928 more than 71% of Belgian cement imports were transported to American markets at less than the American manufacturer had to pay to reach the same markets.

(3) American mills shipping to seaboard markets have been forced to lower delivered prices to a point below the actual delivered cost of the cement and still the American price was not as low as the Belgian price in those markets. Of 18,500,000 bbl. of American cement shipped to competitive seaboard markets in 1927, or 10% of the total shipments in the United States, 80% was sold at an actual loss, ranging as high as 62 cents a barrel. These reductions have dislocated prices in territory adjacent to seaboard on annual shipments of more than half the entire American production.

The amount of duty suggested is 22 cents per 100 lb. or 83.6 cents a barrel. The transportation factor in delivered costs (affecting fuel, raw materials and the delivery of the finished product) produces materially different competitive costs and conditions in the different markets, so that no process of averaging can afford relief. In the 16 more important competitive seaboard markets, the delivered cost of Belgian cement is from 38.17 cents to 116.21 cents a barrel lower than the delivered cost of American cement. The proposed duty will furnish protection for 11 of the 16 markets, but will not protect the remaining five. The import figures for 1928 show that the markets that would be protected by that duty consume 57.55% of the total Belgian imports into the United States, while the markets left inadequately protected consume 38.37%.

The contentions of the importers are without foundation or merit.

(1) As to "monopoly," the fact is that the American industry consists of 94 independent competing companies, no one of which produces more than 10% of the output. The Belgian industry is largely organized as a cartel or combination.

The fact that portland cement normally is quoted and sold at a substantially uniform market price in any one market at any given time (like any completely standardized product sold to fully informed buyers under active, free and unrestrained competition) was thoroughly examined and passed upon by the supreme court of the United States in the case of Cement Manufacturers Protective Association vs. United States (268 U. S. 588, 605) and is made entirely plain in Prof. Henry Parker Willis' book entitled "Portland Cement Prices."

(2) As to the importers' suggestions relating to the present condition of the American industry:

(i) The statistics indicating in some cases an increased volume of business do not imply also increased profits, particularly where in a desperate effort to hold seaboard markets American producers are forced to sell cement below cost. The best efforts of the American producers have resulted in costs above the price at which foreign cement is there sold at a profit.

(ii) A few cases of prosperous companies reflecting the development and accumulation of 20 or 30 years' effort, chiefly before the eruption of foreign cement and in markets not affected thereby, are neither typical of the industry nor relevant to the impending loss by the American industry of its important seaboard and water-reached markets.

(3) The quantity of Belgian cement recently imported must be considered in connection with the facts:

(i) The efforts of the American seaboard plants to hold the markets essential to their existence by selling below cost has tended to retard temporarily the importation of foreign cement, but those plants cannot continue thus to withstand the lower-cost foreign competition.

(ii) The importations represent a large percentage of the cement used in the markets entered—more than half the consumption in one of the seaports affected. Cement is a heavy commodity which cannot readily be moved under American conditions except for short distances. Hence the effect of importations on the American cement industry is particularly severe.

(iii) There is evidence of organization abroad and surveys here directed towards extending the introduction of foreign cements into this country, not only in quantity, but beyond the seaboard to water-reached points on the lake and Mississippi waterways.

(iv) The duty sought would not exclude all foreign cement, but only prevent the sale of about 61% of it below American costs, so that the American plants dependent on seaboard and water-reached markets, may continue to operate.

Warner-Van Sciver Companies Consummate Merger

THE MERGER of the Charles Warner Co. and the Van Sciver Corp. into a new concern to be known as the Warner Co., which will be one of the largest producers of sand and gravel in the United States, was announced March 25. Financing in connection with the merger will be carried out through a banking group headed by Dillon, Read and Co. and including Janney and Co., Hemphill, Noyes and Co., Chandler Co., J. S. Wilson Jr. Co. of Baltimore, and Laird, Bissell and Meads.

The Charles Warner Co. is the outgrowth of a business founded by the Warner family in 1794 and managed successively by five generations of Warners. It was incorporated in 1885, and controls the American Lime and Stone Co., the West Jersey Sand and Supply Corp. and the Cedar Hollow lime and crushed stone properties near Malvern, Penn. The Van Sciver Corp. was established in 1901 and incorporated in 1923. It controls the Knickerbocker Lime Co.—*New York* (N. Y.) *Times.*

Solvay Process Co. Not to Operate Chaumont Quarries Now

THE CHAUMONT quarries, of Adams and Duford, near Chaumont, N. Y., which were purchased by the Solvay Process Co., Syracuse, N. Y., in February, will not be opened until 1930, and 25 or 30 men who had been employed in the quarries last year, will be obliged to seek employment elsewhere.—*Oswego* (N. Y.) *Palladium.*

Editorial Comment

The Tariff Issue Again!

Probably no issue before the American people ever has created, is now creating or ever will create more difference of opinion or more argument than the size, amount and application of protective tariffs—unless it be prohibition. Judging from the platforms of both political parties during the recent presidential election, all shades and kinds of the American public opinion have accepted the *economic principle* of a protective tariff as fundamental to a continuance of our national prosperity. There is no disagreement then on the economic principle involved, so even a nonpartisan business or industrial journal may recommend tariff protection for the industries it serves if the economic ground for it is sound.

This journal has consistently and persistently advocated a protective tariff on portland cement; and, we believe, amply justified our position to all readers in doing so, as a free and independent medium. We believe that the tariff asked for by American portland cement manufacturers as published elsewhere in this issue is modest and presents only a demand for a duty which fairly represents the average difference in costs in this country and in Europe. Hence the portland cement manufacturers have made a strong case, and one to which every fair-minded citizen, be he a producer, user or neither, could give whole-hearted support; because the case of portland cement, as we attempted to show in our editorial of March 30, involves the fundamental principle of tariff protection.

Now then, why have we not been equally aggressive in our advocacy of a protective tariff on some other rock products? The editorial in our March 30 issue explained why. If the other rock products industries can make as good a case as portland cement manufacturers we are for it, and will do our best to help demonstrate the justice of their case. If it is true, as we now understand it is claimed, that Canadian producers are *dumping* large surpluses of sand, gravel and crushed stone at adjacent American consuming centers, at prices below the current Canadian and American market prices, there is no question of the desirability for eliminating it. This *dumping* should be stopped, either by a tariff, or by mutual agreement, or by a code of ethics, in the interests of common decency—the same as *dumping* by one producer on this side of the line in another producer's territory should be stopped.

However, unless there is such *dumping*, practically everyone believes that costs of production and prices in Canada are almost exactly the same as they are in the United States; and consequently the really vital principle of the protective tariff does not enter into the controversy at all. Rock Products' columns are open to the producers of these industries to state their case and prove their point, just as we believe the portland cement manufacturers have already done.

Generations of experience has proved that the value of an independent journal to the clientele it serves is fairness and impartiality. It cannot be the *official* spokesman of any industry and serve that industry to the best advantage. Its sympathies, naturally, are always with the industry that it serves and with the individual producers in that industry; but an independent journal's perspective must be kept sufficiently broad and its viewpoint public minded enough to see beyond that particular industry, and to have a clearer appreciation of the place of that industry in the general scheme of things than a mere reflection of the producers' viewpoint is likely to be.

Naturally our opinions on controversial subjects may seldom find unanimous approval; they may even meet with a very considerable volume of disapproval, temporarily at least, in the heat of the controversy; but we would be negligent in our duty to our industry if we did not give it the benefit now and then of a sympathetic viewpoint, not necessarily *of the industry*, but, in our conception, *for the industry*.

Incidentally, we have been advised that pleas by producers for tariff protection have been so numerous, and so inconsistent (and in some instances the demands so extravagant), and the data accumulated as a result of the ways and means committee hearings so voluminous, that the present probabilities are that the committee of the House of Representatives will present a tariff bill very disappointing to *all* American manufacturers. Therefore it behooves every rock products producer and manufacturer to get busy at once and see that his congressional friends are promptly informed of the sentiments of their constituents on tariff protection in general, and for their commodities in particular. But, for the good of all American industry let these arguments be based on facts and logical and defensible premises, and not merely on a "me too" proposition. Because failure to do this is going to hurt many meritorious cases, where failure to provide a protective tariff will have a far-reaching detrimental effect on our general American prosperity—in which we all will suffer whether our particular commodity is given the benefit of a tariff or not. There are numerous instances of manufacturers asking protection for their commodity and free entry for their raw materials. What we need is a clearer understanding of the whole subject and a clearer distinction between selfish desires and national necessities.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[20]	4- 8-29	89	91	
Alpha P. C. new com.	4- 8-29	50	53	75c qu. Apr. 15
Alpha P. C. pfd.[2]	4- 8-29	116	.....	1.75 Mar. 15
American Aggregates com.	4-10-29	47	50	75c qu. Mar. 1
Amer. Aggregate 6's, bonds	4-10-29	111	112	
American Brick Co.	4- 8-29	16	17	25c qu. Feb. 1
American Brick Co. pfd.	4- 8-29	87½	88	50c qu. Feb. 1
Am. L. & S. 1st 7's[29]	4- 8-29	100	101	
American Silica Corp. 6½'s	4-10-29	96	100	
Arundel Corp. new com.	4- 9-29	38½	39¾	50c qu. Apr. 1
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[10]	4-10-29	no market		
Atlas P. C. com.	4- 8-29	47	50	
Atlas P. C. pfd.	4- 8-29	50	.....	66⅔c qu. Apr. 1
Beaver P. C. 1st 7's[30]	4- 8-29	98	100	
Bessemer L. & C. Class A[4]	4- 8-29	36	36½	75c qu. May 1
Bessemer L. & C. 1st 6½'s[4]	4- 8-29	98¾	99¼	
Bloomington Limestone 6's[29]	4- 8-29	90	.....	
Boston S. & G. new com.[16]	4- 6-29	20	23	
Boston S. & G. new 7% pfd.[16]	4- 6-29	50	52	
Canada Cem. com.[43]	4- 8-29	30	30¼	
Canada Cem. pfd.[43]	4- 8-29	97½	98	1.62½ qu. Mar. 30
Canada Cement 5½'s	4- 6-29	98½	99½	
Canada Cr. St. Corp. 1st 6½'s	4- 6-29	95	97	
Canada Gyp. & Alabastine	4- 8-29	113	115	75c Jan. 2
Certainteed Prod. com.	4- 9-29	16½	17½	
Certainteed Prod. pfd.	4- 9-29	44⅞	49½	1.75 qu. Jan. 1
Cleveland Stone new st'k	4- 9-29	70	75	$10 ex. Apr. 15
Columbia S. & G. pfd.	4- 8-29	91	92¼	
Consol. Cement 1st 6½'s, A[42]	4-10-29	92	94	
Consol. Cement 6½% notes	4-10-29	90	95	
Consol. Cement pfd.[29]	4- 8-29	50	60	
Consol. Oka S. & G. 6½'s (Canada)	4- 5-29	100	102	
Consol. S. & G. com. (Canada)	4- 8-29	.....	17	
Consol. S. & G. pfd. (Canada)	4- 8-29	.....	91	
Construction Mat. com.	4- 9-29	31½	33½	
Construction Mat. pfd.	4- 9-29	47½	48	
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[18]	4- 4-29	97	99	
Coosa P. C. 1st 6's[29]	4- 8-29	50	56	
Coplay Cem. Mfg. 1st 6's[40]	4- 8-29	90	.....	
Coplay Cem. Mfg. com.[40]	4- 8-29	15	.....	
Coplay Cem. Mfg. pfd.[40]	4- 8-29	75	.....	
Dewey P. C. 6's[30]	4-10-29	98½	101	
Dolese & Shepard[7]	4- 9-29	115	120	$2 qu. Apr. 1
Edison P. C. com.[19]	4- 8-29	50c	.....	
Edison P. C. pfd.[19]	4- 8-29	1	.....	
Edison P. C. bonds[19]	4- 8-29	75	.....	
Giant P. C. com.	4- 6-29	36	40	
Giant P. C. pfd.	4- 6-29	37	40	
Ideal Cement, new com.	4- 6-29	74	77	75c qu. Apr. 1
Ideal Cement 5's, 1943	4- 6-29	100	103	
Indiana Limestone com.	4- 8-29	50	.....	
Indiana Limestone pfd.	4- 8-29	98	103	
Indiana Limestone 6's	4- 9-29	90⅞	91¼	
International Cem. com.	4- 9-29	85⅛	85¼	$1 qu. Mar. 28
International Cem. bonds 5's	4- 9-29	103½	104	Semi-ann. int.
Iron City S. & G. bonds 6's[46]	4- 6-29	92	95	
Kelley Is. L. & T. new st'k	4- 9-29	58⅜	60	62½c qu. Apr. 1
Ky. Cons. Stone Co. com.[48]	4- 4-29	14	15	
Ky. Cons. St. com. Voting Trust Certif.[48]	4- 4-29	14	15	
Ky. Cons. Stone 6½'s*[48]	4- 4-29	96	100	
Ky. Cons. St. Trustee Certif.[48] (1 Sh. 7% cum. pfd. & 1 sh. com. stock)	4- 4-29	100	102	
Keystone Sand & Sup. 6's[47]	8-22-28	99	100	
Lawrence P. C.[2]	4- 8-29	93	98	
Lawrence P. C. 5½'s, 1942	4- 3-29	93½	95	
Lehigh P. C.[2]	4- 9-29	52½	53½	62½c qu. May 1
Lehigh P. C. pfd.[2]	4- 9-29	110	110¼	1¾% qu. Apr. 1
Lyman-Richey 1st 6's, 1932[13]	4- 8-29	98	100	
Lyman-Richey 1st 6's, 1935[13]	4- 8-29	97½	99	
Marblehead Lime 6's[14]	4-10-29	102	104	
Material Service Corp.	4- 9-29	33	34	50c qu. Mar. 1
Mich. L. & C. com.[6]	4-10-29	21	25	
Missouri P. C.	4- 9-29	43½	44	50c qu. Feb. 1
Monolith Midwest[9]	4- 4-29	8½	10	
Monolith bonds, 6's	4- 4-29	97	98	
Monolith P. C. com.[9]	4- 4-29	14	14½	8% ann. Jan. 2
Monolith P. C. pfd.[9]	4- 4-29	9	9½	
Monolith P. C. units[9]	4- 4-29	32	33½	
National Cem. (Can.) 1st 7's[38]	4- 6-29	98	.....	
National Gypsum A com.	4- 9-29	12	14	
National Gypsum pfd.[35]	4- 9-29	47	51	
Nazareth Cem. com.	4- 5-29	27	30	
Nazareth Cem. pfd.	4- 5-29	100	.....	
Newaygo P. C. 1st 6½'s[29]	4- 8-29	101	.....	
New Eng. Lime 1st 6's[14]	4-10-29	93	95	
N. Y. Trap Rock 1st 6's	4- 6-29	98½	99½	
North Amer. Cem. 1st 6½'s	4- 8-29	70	.....	
North Amer. Cem. com.	4- 8-29	10	11	
North Amer. Cem. 7% pfd.	4- 8-29	30	35	
North Amer. Cem. units	4- 8-29	40	45	
North Shore Mat. 1st 5's[15]	4-10-29	97	.....	
Northwestern States P. C.[37]	4- 5-29	150	160	
Ohio River S. & G. 6's	4- 6-29	94	97	
Pac. Coast Cem. 6's, A	4- 5-29	92¾	96½	
Pacific P. C. com.	4- 5-29	26	30	
Pacific . P. C. pfd.	4- 5-29	82	83	1.62½ qu. Jan. 5
Pacific P. C. 6's	4- 5-29	98¾	.....	
Peerless Egyp'n P. C. com.[21]	4- 8-29	2¼	3¼	
Peerless Egyp'n P. C. pfd.[21]	4- 8-29	78	85	
Penn-Dixie Cem. 1st 6's[29]	4- 9-29	91⅝	91¾	
Penn-Dixie Cem. pfd.[28]	4- 9-29	83	88	1.75 qu. Mar. 15
Penn-Dixie Cem. com.	4- 9-29	18⅜	19	
Penn. Glass Sand Corp. 1st 6's. 1952	4- 3-29	102½	103½	
Penn. Glass Sand pfd.	4- 3-29	110	.....	
Petoskey P. C.	4- 9-29	10	10¾	1½% qu.
Riverside P. C. com.	4- 5-29	20	.....	
Riverside P. C. pfd.	4- 4-29	.....	21	
Riverside P. C., A	4- 5-29	19½	.....	
Riverside P. C. B.	4- 4-29	1	2	
Sandusky Cem.	3-28-29	248	.....	$2 qu. Apr. 1
Santa Cruz P. C. bonds	4- 5-29	105¾	.....	6% annual
Santa Cruz P. C. com.	4- 5-29	91	.....	$1 qu. Apr. 1
Schumacher Wallboard com.	4- 5-29	16	16⅞	
Schumacher Wallboard pfd.	4- 5-29	24½	25	
Southwestern P. C. units[44]	4- 4-29	270	.....	
Superior P. C., A[20]	4-10-29	46	48	27½c mo. Mar. 1
Superior P. C., B[38]	4-10-29	33	36	
Trinity P. C. units[37]	4- 5-29	155	.....	
Trinity P. C. com.[37]	4- 5-29	50	.....	
U. S. Gypsum com.	4- 9-29	60	61	2% qu. Mar. 31
U. S. Gypsum pt. paid	4- 8-29	44	.....	
U. S. Gypsum pfd.	4-10-29	125	126	1¾% qu. Mar. 31
Universal G. & L. com.[3]	4-10-29	.....	1	
Universal G. & L. pfd.[3]	4-10-29	.....	10	
Universal G. & L., V.T.C.	4-10-29	no market		
Universal G. & L. 1st 6's[3]	4-10-29	50	60	
Chas. Warner com.	4- 8-29	38	42	50c qu. Apr. 15
Chas. Warner pfd.†	4- 8-29	110	.....	1¾% qu. Apr. 25
Whitehall Cem. Mfg. com.[36]	4- 9-29	150	.....	
Whitehall Cem. Mfg. pfd.[36]	4- 9-29	98	.....	
Wisconsin L. & C. 1st 6's[15]	4-10-29	98	.....	
Wolverine P. C. com.	4- 9-29	6	.....	15c qu. Feb. 15
Yosemite P. C., A com.[20]	4- 4-29	5	6	

Ann. interest due May 1 and Nov. 1. Semi-ann. coupon of $32.50 paid Nov. 1. †First and 2nd pfd. called for redemption at 110, April 25.

[1]Quotations by Watling Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willet, New York. [3]Quotations by Rogers, Tracy Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hoit, Rose & Troster, New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., Detroit. [22]Pirnie, Simons and Co., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach & Co., Inc., Chicago. [25]Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White & Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass. [35]Farnum, Winter & Co., Chicago. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick & Co., Montreal, Que. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [41]Hornblower & Weeks, New York City and Chicago. [42]E. H. Rollins, Chicago, Ill. [43]Jones, Heward & Co., Montreal, Que. [44]Tenney Williams & Co., Inc., Los Angeles, Calif. [46]Stein Bros. & Boyce. Baltimore, Md. [47]Bank of Pittsburgh, Pittsburgh, Pa. [48]E. W. Hays & Co., Louisville, Ky.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
American Brick Co. pfd. (sand-lime brick) 16 sh.[6]	par 25	25¾
Benedict Stone Corp. 1st 7's 1934[8]	.....	86
International Portland Cement Co., Ltd., pfd.	30	45
Knickerbocker Lime Co.[4]	105	.....
River Road Sand and Gravel Co.,[9] 200 shares	$21 per share	.....
River Road Sand and Gravel Co.,[11] 219 shares	$55 per share	.....
Seaboard P. C.[1] 6% bonds ($7,500) 7-1-27. July, 1910, and subsequent coupons attached	$10 for the lot	.....
Southern Phosphate Co.[6]	1¼	.....
Universal Gypsum com. free stk.[1] 300 shares	$75 for the lot	.....
Universal Gypsum com.[1] 153 shares (no par)	$51 for the lot	.....
Vermont Milling Products Co. (slate granules), 22 sh. com. and 12 sh. pfd.[6]	$1 for the lot	.....
Winchester Brick Co., pfd., sand lime brick[5]	10c	.....
Winchester Rock Brick Co. pfd., 1 share (par $25) and 1 share com. (par $10)[6]	$8 for the lot	.....
Winchester Brick Co. pfd.[10] 250 sh. (par $10)	$100 for the lot	.....

[1]Price obtained at auction by Adrian H. Muller & Sons, New York. [2]Price at auction by R. L. Day & Co., December 26, 1928. [4]Price obtained at auction by Barnes and Lofland, Philadelphia, on April 4, 1928. [5]Price obtained at auction for lot of 50 shares by R. L Day & Co., Boston, Mass. [6]Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass. [8]Auction sales of $1000, Barnes & Lofland, Philadelphia, March 31, 1928. [9]Price obtained at auction by Barnes & Lofland, Sept. 26, 1928. [10]Price at auction Dec. 19, 1928, R. L. Day & Co., Boston, Mass. [11]Price at auction Nov. 21, 1928, by Barnes & Lofland.

United States Gypsum Co. Earnings in 1928

THE UNITED STATES GYPSUM CO., Chicago, Ill., closed 1928 in a firmly entrenched financial position notwithstanding the fact that the extremely severe competitive conditions in the industry resulted in a further reduction in earnings last year.

The consolidated report of the company and its subsidiaries for the year ended December 31, 1928, showed a net income of $6,031,635 after depreciation, depletion, federal taxes and all other charges, equal after preferred dividends to $7.22 a share on 760,436 shares of $20 par common stock outstanding at the close of the year, as compared with $7,538,508, or $10.10 on 691,198 common shares, in the previous year.

Evidence of the keen competitive condition in the gypsum industry is seen from the steady decline in the earnings of the company during the last several years. Compared with 1925, the company's profits last year show a decline of more than 25%. Furthermore, last year's earnings were benefited by a substantial decrease in operating expenses, according to Sewell L. Avery, president, who told the stockholders that economies in operation last year amounted to around $2,500,000.

Referring to competition, Mr. Avery in his remarks accompanying the annual report says:

"Competitive conditions have been of a severity unknown in the industry for many years. Starting early in the spring and continuing without abatement throughout the year, price declines have been such as to severely assail all commodities in all sections. In important sales divisions and on major commodities the common struggle to retain establishment has led manufacturers to sell frequently at prices lower than cost. Our company has faced this condition with reluctance and met the conditions with restraint."

Despite the decline in earnings, the company closed the year with cash and government securities amounting to nearly $9,000,000 and with total current assets of $16,276,738, or more than five times current liabilities of $2,957,160. This compared with current assets and current liabilities of $15,124,583 and $2,639,242 at the end of the preceding year.

Mr. Avery told the stockholders at the annual meeting that the amount of tonnage sold so far this year was about 12% greater than in the same period last year, but due to lower selling prices, earnings were considerably less than last year's. "The company is better equipped to cope with present competitive conditions through improved personnel and economies in production," Mr. Avery said. "New products should be responsible for profitable business in 1929 and competition should be lessened. Our Boston plant will be operating in a short time and other new plants will be completed about July. Building construction during the next three months will probably hold up, but it is not the type of construction favorable to increase business for our company, being largely industrial."

At the annual meeting the stockholders re-elected the retiring directors and elected C. W. Higley to the directorate to fill the unexpired term of H. E. Brookby, who resigned some time ago. The directors re-elected the officers and declared the regular quarterly dividend on the common and preferred stocks.

A comparison of the financial statements for the last four years follows:

CONSOLIDATED INCOME ACCOUNT OF THE UNITED STATES GYPSUM CO.

Years ended December 31:	1928	1927	1926	1925
Net earnings	$ 8,325,322	$ 9,961,466	$10,763,219	$10,474,302
Depreciation and depletion	1,517,082	1,307,998	1,063,380	848,008
Federal taxes	776,605	1,114,960	1,324,092	1,212,178
Net income	6,031,635	7,538,508	8,375,747	8,414,117
Preferred dividends	541,503	554,552	567,563	579,925
Common dividends	1,161,698	1,793,545	6,116,089	3,790,002
Common stock dividends	*1,383,004			
Surplus for year	2,945,430	5,190,411	1,692,095	4,044,189
Paid on capital stock	14,625	237,826	322,915	150,101
Previous surplus	24,233,219	18,804,982	16,789,971	12,595,681
Profit and loss surplus	$27,193,274	$24,233,219	$18,804,982	$16,789,971
*Earned on common	$7.22	$10.10	$11.35	$15.45

*On 760,436 shares in 1928; 691,198 shares in 1927; 687,875 shares in 1926; 506,915 shares in 1925.

CONSOLIDATED BALANCE SHEET OF THE UNITED STATES GYPSUM CO.

ASSETS

As of December 31:	1928	1927	1926	1925
Plant and property	$38,491,702	$34,008,606	$29,332,434	$23,951,618
Contingent advertising		498,545	838,054	680,458
Stock subscriptions	6,411,395			
Investments	196,698	160,033	127,814	119,119
Deferred charges	750,571	639,367	463,956	238,682
Current assets:				
Cash	1,491,516	1,333,346	1,123,704	899,270
Receivables	4,203,138	4,258,980	4,448,777	4,482,106
Government securities	7,497,096	6,100,350	5,647,006	6,515,129
Inventories	3,084,988	3,431,907	3,754,123	3,319,319
Total current	$16,276,738	$15,124,583	$14,973,610	$15,215,824
Total assets	$62,127,104	$50,431,134	$45,735,868	$40,205,701

LIABILITIES

Preferred stock	$ 7,841,700	$ 8,141,600	$ 8,441,600	$ 8,741,600
Common stock	22,810,820	13,823,960	13,757,500	10,138,300
Reserve for returns and contingenies	1,324,151	1,593,114	1,663,049	1,654,800
Surplus	27,193,274	24,233,219	18,804,982	16,789,971
Current liabilities:				
Accounts payable	1,139,716	924,426	1,210,554	1,183,038
Accruals	1,817,444	1,714,815	1,858,183	1,697,992
Total current	$ 2,957,160	$ 2,639,242	$ 3,068,737	$ 2,881,030
Total liabilities	$62,127,104	$50,431,134	$45,735,868	$40,205,701

—(Chicago) *Journal of Commerce.*

Ideal Cement Company Earnings

THE Ideal Cement Co., Denver, Colo., reports for the year ended December 31, 1928, consolidated net income of $2,061,673 after charges, equal to $5.11 a share on the 403,200 no par common shares outstanding. This compares with $2,243,957, equal after preferred dividends (since retired) to $8.33 a share on the 200,056 no par common shares then outstanding.

The consolidated balance sheet as of December 31, 1928, showed current assets of $8,638,573, and current liabilities of $882,604, leaving net working capital of $7,755,969.

ASSETS—Cash and marketable securities, $5,524,659; accounts receivable $685,789; manufactured goods, $655,461; inventory, $1,772,664; deferred charges, $99,704; plant and property less depreciation, $17,195,186; land, less depletion, $1,238,622; total, $27,172,085.

LIABILITIES—Accounts payable, $222,814; accruals, $661,790; 5% convertible debentures, $8,279,400; reserves, $127,436; stock of subsidiary companies not owned, $11,626; capital and surplus (represented by 403,200 no par shares) $17,871,017; total, $27,172,085.

In his report to stockholders Charles Boettcher, president, said in part:

"On July 1, 1928, a recapitalization of the company was effected by means of which all outstanding preferred stock was retired and in lieu thereof, $8,500,000, 15-year, 5% convertible debentures were issued. This has reduced prior charges on earnings and has justified the increase in dividends. Up to December 31, 1928, $220,600 principal amount of these debentures have been converted into stock of the company, making the total outstanding, 403,200 shares."

Pass Certain-teed Products Preferred Dividend

THE directors of the Certain-teed Products Corp., New York City, voted to omit payment of quarterly dividend of $1.75 a share on the preferred, which is usually paid April 1. Common distributions were discontinued last December.

Cement Company Earnings Compared

FIVE REPRESENTATIVE portland cement companies show in their published profit figures for 1928 a combined increase of approximately 1%, compared with 1927, according to a compilation from published financial statements by the statistical department of Ernst and Ernst, accountants.

	Net profits 1928	Net profits 1927
Alpha Portland	$2,585,535	$2,359,286
Giant Portland	174,870	182,119
International	5,129,284	4,554,172
Pennsylvania-Dixie	1,293,851	1,967,493
Wolverine Portland	51,031	82,444
	$9,234,571	$9,145,514

Percentage increase—0.97%.

New England Lime Co. Balance Sheet

FOLLOWING is the balance sheet of the New England Lime Co., Pittsfield, Mass., for the fiscal year 1928:

Gross income	$1,524,191.38
Less: Operating expense	1,226,411.92
Net operating profit	$ 297,779.46
Add: Other income	3,130.50
Net profit before interest, depletion and depreciation	$ 300,909.96
Less: Interest, depletion and depreciation	219,095.57
Net profit before federal income tax	$ 81,814.39
Less: Provision for federal income tax	$ 9,794.71
Net profit available for dividends	$ 72,019.68
Surplus at end of fiscal year	250,163.37

Warner Company Financing to Absorb Van Sciver Corporation

DILLON, READ AND CO., bankers, New York City, are offering at 99 and interest $7,000,000 in first mortgage 6% sinking fund bonds (with common stock subscription warrants) in the new Warner Co., of Philadelphia, Penn., and Wilmington, Del., which will include the business and operations of both the present Charles Warner Co. and the Van Sciver Corp. Application is to be made to list these bonds on both the New York and Philadelphia Stock Exchanges. A letter from Charles Warner, president of the company, to the bankers contains the following data:

HISTORY AND BUSINESS—The Warner Co. has been organized under the laws of Delaware to acquire the businesses, and substantially all of the assets, subject to certain liabilities, of Charles Warner Co. and the Van Sciver Corp., both of which companies have been engaged primarily in the production, transportation and wholesaling of sand, gravel and lime products, and in the retailing of such products and of plaster, cement and mixed concrete, in Philadelphia and Wilmington. The predecessor companies have been long established. The Charles Warner Co. was incorporated in 1885 as successor to a transportation and merchandising business founded by members of the Warner family in 1794. The Van Sciver Corp. was incorporated in 1923 to consolidate the operations of companies formed as an outgrowth of the entrance of the Van Sciver family into the concrete sand business in 1901.

The Warner Co. will be the largest company supplying sand and gravel in the Philadelphia district. Assets to be acquired will include sand, gravel and limestone reserves, plants for washing, crushing and screening sand and gravel, and for the manufacture of lime and limestone products, wharves and distributing yards, trucks and marine equipment. Through its wharves and other facilities for distribution, the company will supply a large consuming market with sand and gravel and other building materials.

CAPITALIZATION AND PURPOSE OF ISSUE—The capitalization of the Warner Co., upon completion of this financing and the acquisition of assets as above, is to be as follows:

	Authorized	Presently to be outstanding
First mortgage 6% sinking fund bonds (this issue)	$7,000,000	$7,000,000
$7 First preferred stock—without par value, shares.. (Annual sinking fund, commencing April, 1930, sufficient to retire 3% of largest amount of shares at any time outstanding.)	50,000	31,500
$7 Second preferred stock—without par value, shares.. (Semi-annual sinking fund of $200,000 per annum commencing June, 1930, increasing to $400,000 in 1934.)	57,500	57,500
Common stock—without par value, shares	350,000*	203,000

*Of this amount 74,000 shares are to be reserved against subscription warrants, identical in substance, to be issued as follows: 35,000 shares against warrants to be issued with these bonds; 31,500 shares against warrants to be issued with 31,500 shares of $7 first preferred stock, and 7500 shares against warrants to be issued in exchange for outstanding rights to purchase common stock of Charles Warner Co.

The proceeds of these bonds, and of 31,500 shares of $7 first preferred stock, are to be used in connection with the acquisition of assets, and the retirement of certain indebtedness, of the predecessor companies. The entire issue of $7 second preferred stock is to be taken by vendor interests in part payment for assets.

SECURITY—These $7,000,000 first mortgage 6% sinking fund bonds (closed issue) are to be the direct obligation of the Warner Co., and are to be secured by first mortgage lien upon mortgageable fixed assets which have been appraised by Lockwood Greene, Engineers, Inc., at a present replacement value, less depreciation, of more than $11,500,000, subject only to $365,000 redeemable amount of ground rents payable. In addition, the line of the mortgage is to cover certain items of marine equipment presently to be acquired, such items having a total appraised value of not less than $2,500,000, subject to such maritime lien claims as may arise against the respective items. The lien of the mortgage is also to cover fixed assets hereafter acquired.

EARNINGS—Combined consolidated earnings of the predecessor businesses, for the five years ended December 31, 1928, after depreciation and depletion, and after ground rentals and leasehold purchase contract payments, but before interest and federal income taxes, have been certified by Messrs. Haskins and Sells as follows:

1924	$1,440,456
1925	2,618,151
1926	2,932,558
1927	2,377,583
1928	2,023,333

Combined earnings, as shown above, of $2,023,333 for the year 1928, were approximately four times the maximum annual interest requirement of $489,692 on all interest-bearing indebtedness of the company presently to be outstanding, including this issue of bonds. After deduction of such maximum interest requirement, and after allowance for discount on these bonds, for federal income taxes at 12% per annum, and for dividends on first and second preferred stocks presently to be outstanding, there remains $695,804 in 1928, equivalent to $3.43 a share on the 203,000 shares of common stock presently to be outstanding.

It is believed by the management, and is confirmed by Day and Zimmermann, Inc., in their report on the operations of the business, that earnings should be substantially increased through the elimination of duplicate facilities, and through other economies in the operation of the combined businesses under one management.

BALANCE SHEET—The pro forma consolidated balance sheet of the Warner Co. and its subsidiary companies, as at December 31, 1928, based on the balance sheets of the predecessor companies as at that date, adjusted to give effect to the acquisition of assets and assumption of liabilities as above, to the retirement of indebtedness, including $1,250,000 notes issued subsequent to the above date, to the capitalization of the Warner Co., to the revaluation of the capital assets to be acquired from the Van Sciver Corp., and to other adjustments, as certified by Haskins and Sells, is as follows:

ASSETS

Current assets:		
Cash	$	529,436
Accounts and notes receivable, less reserve		1,777,965
Inventories		909,616
Total current assets	$	3,217,011
Land, mineral deposits, buildings and equipment:		
Formerly of Charles Warner Co., as per books of that company, less reserves	$	5,795,679
Formerly of the Van Sciver Corp., at present replacement values, less depreciation, as appraised by Lockwood Greene, Engineers, Inc.		11,432,013
		$17,227,692
Investment at cost (including interests in affiliated companies)	$	472,829
Fire insurance and workmen's compensation funds		126,444
Deferred charges		673,872
		$21,717,848

LIABILITIES

Current liabilities:		
Accounts payable	$	232,379
Accrued federal income tax		230,059
Other accruals		184,076
Total current liabilities	$	646,514
First mortgage 6% sinking fund bonds (this issue)	$	7,000,000
Purchase money obligations:		
For "Arsenal" mineral deposits ($121,500 payable semi-annually commencing June 19, 1929)	$	972,000
For capital stock of subsidiary company ($50,220 payable annually commencing March 1, 1929)		401,760
	$	1,373,760
Ground rentals payable (present redeemable amount)	$	365,000
Leasehold purchase contracts*		752,000
Reserves for fire insurance, workmen's compensation, and repairs		174,883
Capital stock:		
$7 First preferred stock (31,500 shares, without par value)	$	3,150,000
$7 Second preferred stock (57,500 shares, without par value)		5,750,000
Common stock, represented by 203,000 shares without par value, and surplus at organization		2,505,691
		$11,405,691
		$21,717,848

*Represents installments aggregating at the annual rate of $97,000 until 1934, when titles pass to lessee upon final payments of $200,000.

The above balance sheet shows current assets of $3,217,011, as compared with current liabilities of $646,514. Net tangible assets, after deducting reserves and all liabilities except these bonds, are shown as $17,731,819.

MANAGEMENT—The management of the Warner Co. will include the following officers, who have served in similar capacities for the Charles Warner Co.: Charles Warner, president; A. D. Warner, Jr., vice-president and treasurer; and, as vice-presidents, Irving Warner, Charles C. Bye, Reed C. Bye, Alexander Foster, Jr., and Charles Shoemaker.

The foregoing officers will together comprise an executive committee, under the direction of which the business of the Warner Co. will be conducted.

WARRANTS—Each bond is to carry a subscription warrant, detachable after October 1, 1929, entitling the holder thereof to purchase, on or before April 1, 1934, five shares of the common stock of the company at the following rates per share of common stock: to and including April 1, 1930, at $40 a share; thereafter to and including April 1, 1932, at $45 a share; and thereafter to and including April 1, 1934, at $50 a share.

The warrants are to contain provisions designed to protect the warrants against the effects of dilution.

SINKING FUND—The indenture is to provide for a sinking fund sufficient to retire $200,000 principal amount of bonds per annum, payable semi-annually commencing August 1, 1929, to be applied to the retirement of bonds by purchase at or below the then current redemption price, or, to the extent not so obtainable, by redemption of bonds by lot at that price.

DESCRIPTION OF BONDS—The first mortgage 6% sinking fund bonds are authorized in the principal amount of $7,000,000, all of which is presently to be issued. The bonds are to be dated April 1, 1929, and to mature April 1, 1944. They are to be coupon bonds in denomination of $1000, registerable as to principal only. They are to bear interest at the rate of 6% per annum, payable semi-annually on April 1 and October 1, without deduction for federal income tax not exceeding 2% per annum. The bonds are redeemable at 105 and accrued interest.

Kelley Island Balance Sheet

THE BALANCE SHEET of the Kelley Island Lime and Transport Co., Cleveland, Ohio, the largest manufacturer of lime in the United States, and among the two or three largest producers of crushed limestone in the world, is as follows:

THE KELLEY ISLAND LIME AND TRANSPORT COMPANY

Balance Sheet—December 31, 1928

ASSETS

Cash	$ 49,923.61
Accounts receivable	547,786.95
Notes receivable	31,258.85
Inter-company accounts	20,851.85
Interest accrued	423.74
Unadjusted debits	3,091.28
Prepaid insurance, etc.	10,356.84
Advances	77,443.73
Investments	3,856,324.34
Permanent assets—Land, plant and equipment	6,862,951.51
TOTAL ASSETS	$12,073,467.54

LIABILITIES

Accounts payable	$ 116,955.50
Reserves	301,220.21
Taxes accrued	41,137.40
Income tax accrued	175,771.45
Capital stock	7,723,800.00
Surplus	3,714,582.98
TOTAL LIABILITIES AND SURPLUS	$12,073,467.54

Balance Sheet of New York Trap Rock Corp.

THE condensed consolidated balance sheet of the New York Trap Rock Corp., New York City, and subsidiaries follows:

NEW YORK TRAP ROCK CORP. AND SUBSIDIARIES—CONDENSED CONSOLIDATED BALANCE SHEET, DECEMBER 31, 1928

ASSETS

Current assets:		
Cash	$ 436,206.36	
Marketable securities, at cost	238,670.00	
Trade notes receivable	175,615.23	
Accounts receivable (less reserve for doubtful accounts, $12,992.23)	1,882,204.47	
Inventories (physical inventories, at cost; quantities not verified under audit):		
Materials and supplies	454,016.20	
Crushed stone and lime dust ready for market (work in process and uncrushed stone not included)	36,962.06	
Total current assets		$ 3,223,674.32
Special deposits (including deposits to cover redemption of called bonds—contra), deferred accounts receivable, etc.		129,542.76
Property, plant and equipment		17,351,831.56
Deferred charges		55,497.19
Total		$20,760,545.83

LIABILITIES

Notes and accounts payable and accruals		$ 839,276.05
Federal and state taxes—estimated		302,993.36
Bonds called, not presented for redemption		1,500.00
Funded debt:		
Twenty-year first mortgage 6% sinking fund gold bonds, due December 1, 1946	$ 5,998,000.00	
Ten-year 7% sinking fund gold debentures, due December 1, 1936	1,001,000.00	
Total funded debt		6,999,000.00
Reserves:		
For depreciation of quarry buildings and equipment	$ 1,017,449.35	
For depreciation of marine equipment	221,077.67	
For depletion	134,935.55	
For compensation insurance claims	56,192.42	
Total reserves		1,429,654.99
Equity of minority shareholders of Carbonate of Lime Corp.		96,230.08
Capital stock and surplus:		
Capital stock:		
Preferred, 20,000 shares of no par value	$ 2,000,000.00	
Common, 180,000 shares of no par value (including shares reserved for old stock not yet converted)	5,875,924.84	
Capital surplus (representing part of appreciation of property taken into accounts in 1918, and other adjustments)	377,825.46	
Profit and loss surplus	2,838,141.05	
Total capital stock and surplus		11,091,891.35
Total		$20,760,545.83

NEW YORK TRAP ROCK CORP. AND SUBSIDIARIES—SUMMARY OF CONSOLIDATED INCOME AND PROFIT AND LOSS FOR THE YEAR ENDED DECEMBER 31, 1928

Gross operating profit, before providing for depreciation and depletion		$ 3,075,557.87
Administrative, selling and general expenses		333,540.36
Net operating profit, before providing for depreciation and depletion		$ 2,742,017.51
Other income:		
Interest earned	$ 20,121.04	
Miscellaneous	64,322.69	
Total		84,443.73
Gross income, before providing for depreciation and depletion		$ 2,826,461.24
Income charges:		
Interest on funded debt	$443,966.51	
Interest on current indebtedness	26,271.18	
Provision for depreciation	366,948.65	
Provision for depletion	61,702.94	
Provision for doubtful accounts	18,153.67	
Provision for federal and state taxes	274,061.80	
Excess of cost of maintenance of employes' houses over rentals received therefor	12,776.88	
Premiums on bonds and debentures retired	7,570.00	
Total		1,211,451.63
Net income		$ 1,615,009.61
Profit and loss credit—miscellaneous adjustments applicable to prior years (net)		22,032.68
Profit and loss surplus for the year before dividends, etc.		$ 1,637,042.29
Less:		
Dividends on preferred capital stock of the New York Trap Rock Corp.	$140,000.00	
Dividends paid to minority shareholders of subsidiary, and minority interest in surplus of subsidiary	15,668.16	
Total		155,668.18
Profit and loss surplus for the year		$ 1,481,374.13
Profit and loss surplus, January 1, 1928		1,356,766.92
Profit and loss surplus, December 31, 1928		$ 2,838,141.05

Earned $8.11 a common share in 1928, against $6.75 a share in 1927.

Recent Dividends Announced

Arundel Corp. (quar.)	50c, Apr. 1
Bessemer L. & C. Class A (quar.)	50c, May 1
Cleveland Stone (extra div.)	$10.00, Apr. 15
Chas. Warner com. (quar.)	50c, Apr. 15
Chas. Warner pfd. (quar.)	$1.75, Apr. 25

Gypsum Manufacturers Adopt Code to Govern Trade Practices

Resolutions Include Endorsement of Exchange of Price Quotations

COMMERCIAL BRIBERY, inducing breach of contracts, sales without profit to promote the sales of other products, sales below cost with the intent of injuring competitors, various forms of price discrimination, rebates and other practices deemed uneconomical and unethical, are condemned in resolutions approved recently after two days of discussion at a trade practice conference of gypsum manufacturers at the Waldorf-Astoria hotel, New York City. The resolutions will now be submitted officially to the Federal Trade Commission for such action as it may deem advisable.

Particularly interesting is Rule 21, which indorses "the practice on the part of each manufacturer of distributing and circulating to the entire industry current price lists and all notices of advance and (or) decline in prices, provided, that each manufacturer shall act with regard to prices with entire independence." A similar rule was adopted by the conference of the millwork industry in Chicago last May and was approved by the commission in June. Early this year, however, the commission rescinded its action, saying that in the present state of the law it "cannot receive a resolution of the industry for the circulation of prices which is not confined to past transactions."

Other rules for the most part conform to the general pattern fixed in preceding conferences, with changes in details in accordance with the particular needs of the industry. Under the customary practice, the commission will take the resolution under advisement, eliminating any which it cannot approve and grouping the rest in two groups, one of practices deemed illegal, the other of practices not illegal, but judged by the industry to be uneconomical. The manufacturers will then be asked to agree to abide by the resolutions in their future business activities.

The commission was represented on the first day of the conference by Chairman William E. Humphrey and M. Marham Flannery, director of trade practice conferences. James Leenhoutz of Grand Rapids, Mich., president of the Gypsum Institute, which sponsored the conference, presided at first, but later turned the meeting over to L. I. Neale of New York, chairman of the committee which drew up the code. Members of the committee, in addition to Messrs. Leenhoutz and Neale, were Eugene Holland of Chicago and J. F. Haggerty of Buffalo. W. J. Fitzgerald, secretary of the institute, acted as secretary of the conference.

The text of the resolutions adopted follows:

Commercial Bribery

"Rule 1. The paying, or promising to pay, to an employe of a customer or prospective customer, of a commission or consideration of any character for the purpose of inducing or compensating for a sale, is an unfair trade practice.

"Rule 2. The offering or giving of commissions, prizes, premiums or gifts, as an act of commercial bribery, to any one in connection with the sale, purchase or use of any product distributed by manufacturers within the industry, or as an inducement thereto, is an unfair trade practice.

Branding

"Rule 3. The marking or branding or nonbranding of products for the purpose and with the effect of misleading or deceiving the purchasers with respect to the quantity, quality, grade or substance of the goods purchased, is an unfair trade practice.

Inducing Breach of Contract

"Rule 4. The wilful interference by any person, firm, corporation or association, by any means or device whatsoever, with any existing contract or order between a seller and a purchaser, in or about the purchase or sale of any product handled by the industry, or the performance of any contractual duty or service connected therewith, such interference causing a breach of an existing contract or order and being for the purpose or with the effect of dissipating, destroying or appropriating, in whole or in part, the patronage, property or business of another engaged in such industry, is an unfair trade practice.

"Note: Whenever notice of existence of a contract or order is brought to the attention of any person in any way, he shall promptly discontinue all efforts to induce a contracting party to break such contract or order.

Sales Without Mutuality

"Rule 5. A contract of sale which permits the buyer to cancel or provide for a reduced price in the event of a market decline and which does not permit the seller to cancel or provide for an enhanced price in the event of a market rise, is lacking in mutuality and tends to induce controversy and breach of contract, and is, therefore, an unfair trade practice.

Inducing Sales by Other Products

"Rule 6. The practice of offering a product at a price lower than the competitive market price for that product in the particular locality as an inducement for the purchase of one or more other products constitutes discrimination and tends toward the creation of monopoly and the lessening of competition and is an unfair trade practice.

"Rule 7. The sale of certain products without profit for the purpose, directly or indirectly, or with the effect, of furthering the sale of some other product constitutes discrimination when it tends toward the creation of monopoly and the lessening of competition and is an unfair trade practice.

Defamation of a Competitor

"Rule 8. The defamation of a competitor in any manner, either by imputing to him dishonorable conduct, inability to perform contracts, or questionable credit standing, or a false disparagement of the grade or quality of his goods or otherwise, is an unfair trade practice.

Fraud and Misrepresentation

"Rule 9. The making, causing or permitting to be made or published any false, untrue or deceptive statement by way of advertisement or otherwise concerning grade, quality, character, nature, origin, manufacture or preparation of products is an unfair trade practice.

Selling Goods Below Own Cost

"Rule 10. Selling of goods below own cost for the purpose of injuring a competitor and (or) with the effect of lessening competition is an unfair trade practice.

"Note: Cost, as used in the preceding paragraph, shall be interpreted to include among other items the cost of raw materials, transportation thereof, manufacturing, depreciation, depletion, obsolescence, interest on investment, selling and administrative expense. It is the judgment of this conference that all manufacturers of gypsum products should adopt a uniform cost system.

Threats of Suit for Patent or Trademark Infringement

"Rule 11. The circulation of threats of suits for infringement of patent or trademark among customers or a competitor not

made in good faith, but for the purpose of harassing and intimidating customers, is an unfair trade practice.

"Note: The owner of a patent or trademark should, in fairness, first notify the alleged infringer before proceeding against his customers.

Enticement of Employes

"Rule 12. Interference with a competitor's business through the enticement of his employes from his employment is an unfair trade practice.

Imitation of Trade-marks and Trade Names

"Rule 13. The imitation of the trademarks or trade names of a competitor results in deception to buyers and consumers, is an invasion of the property rights of such competitor and is an unfair trade practice.

Anti-Dumping

"Rule 14. The practice of manufacturers and sellers of shipping quantities of merchandise into territories outside of their particular territories, and of selling such merchandise below the general market prevailing in such other territories into which shipments are made, seriously tends to demoralize the market within the territories into which shipments are made, disrupts normal competitive conditions throughout the entire industry, and is an unfair trade practice.

Transit Shipments

"Rule 15. The practice of making shipments, other than those involving mere transfers of material to the warehouses or plants of the shipper, without in each case having an order from the customer for the shipment at the time of making the same, is an unfair trade practice.

Pooled and Combination Cars

"Rule 16. The sale of products to separate purchasers, as full carload or other group lots at a price which does not take into consideration all transportation charges, is an unfair trade practice.

Discrimination in Price and Terms

"Rule 17. Section 2 of the Clayton Act provides: 'That it shall be unlawful for any person engaged in commerce in the course of such commerce either directly or indirectly to discriminate in price between different purchasers of commodities * * * which commodities are sold for use, consumption or resale, where the effect of such discrimination may be to substantially lessen competition or tend to create a monopoly in any line of commerce. Provided, that nothing herein contained shall prevent discrimination in price between purchasers of commodities on account of difference in the grade, quality or quantity of the commodity sold, or that makes only due allowance for the difference in cost of selling or transportation, or discrimination in prices in the same or different communities made in good faith and to meet competition, and provided further, that nothing herein contained shall prevent persons engaged in selling goods, wares or merchandise in commerce from selecting their own customers in bona fide transactions and not in restraint of trade.'

"Any violation of the above law shall be considered an unfair trade practice.

Terms of Sale

"Rule 18. The industry hereby records its approval of the practice of establishing definite terms of sale, and the reasonable adherence thereto, and the continued violation by a manufacturer of his terms, for the purpose and with the effect of price discrimination, shall be deemed an unfair trade practice.

Rebates

"Rule 19. The payment or allowance of rebates, refunds, credits or unearned discounts, whether in the form of money or otherwise, for the purpose and with the effect of extending to certain purchasers special services or privileges not extended to all purchasers under like terms and conditions, is an unfair trade practice.

Unfair Specific Practices

"Rule 20. Included within the practices prohibited, where they constitute rebates and where they are indulged in for the purpose and with the effect of discriminating in price and terms among purchasers of the same class purchasing under like conditions, are price concessions in the furnishing of materials without charge, giving of allowances for advertising not actually placed, the making of allowances on damaged sacks in excess of their actual value, the making of allowances for unsupported claims for damage or shortage of goods in transit, the making of allowances on unverified complaints of the quality of goods, and shipments without charge in excess of the stated quantity ordered or contracted for.

Publication of Price Lists

"Rule 21. The industry hereby records its approval of the practice on the part of each manufacturer of distributing and circulating to the entire industry current price lists and all notices of advance and (or) decline in prices, provided, that each manufacturer shall act with regard to prices with entire independence. (United States Gypsum Co. present but not voting on this rule.)"—*New York Journal of Commerce.*

Cement Tax Pays for Hospital

A NOVEL PLAN for the support and construction of hospitals has been hit on in Peru. The Department of Commerce was informed that a tax of $0.24 per 100 kilos has been placed upon foreign or domestic cement entering through its ports. The proceeds will be used for two hospitals.

Rock Products Offers Safety Award

(Reprinted from the March 15 issue of the *National Sand and Gravel Bulletin*)

ALTHOUGH there appears to be no logical explanation of the situation, the sand and gravel industry is one major business in the United States which has never undertaken any concerted campaign looking toward the promotion of safety work and the elimination of accidents. But we know that every producer in the country will be interested in learning of the generous offer made by Rock Products to award a prize of $250 in the form of some suitable emblem to that member of the National Sand and Gravel Association having the best no-accident record in any one year in a safety contest to be supervised by the Bureau of Mines.

The offer was presented to the executive committee of the association by Nathan C. Rockwood, editor of Rock Products, and was accepted. The specific terms of the offer as outlined by Mr. Rockwood are:

"Rock Products offers a prize of two hundred and fifty dollars, in the form of a loving cup, plaque, or something else selected by the committee, to that member of the National Sand and Gravel Association having the best no-accident record in any one year in a safety contest to be supervised by the Bureau of Mines."

The association is working out the details of the contest in co-operation with W. W. Adams, supervising statistician of the Bureau of Mines, and the full program will be announced at a later date. It is hoped that the sand and gravel industry will be fully conscious of the importance of the principles underlying contests of this kind. It yields benefits not alone of a humanitarian nature, but the reduction of accidents will be reflected in substantial savings in compensation insurance.

The production of sand and gravel constitutes one of the major mineral industries of the United States. The value of the yearly output, as pointed out by Mr. Adams, is considerably in excess of all of the gold and silver mines of the country. The last available records of our industry in possession of the government cover 1927, and in that year the value of the total production of sand and gravel was about a tenth of the total value of all nonmetallic minerals, excluding fuels, produced during the year. The sand and gravel industry produces a larger annual tonnage than any other nonmetallic industry, excluding mineral fuels, and the value of its yearly output ranks third, being exceeded only by that of the cement and the stone industries.

In view of the great magnitude of the industry, whether measured by tonnage or value, it is pertinent to ask, suggests Mr. Adams, how it ranks with other branches of mining and quarrying in the matter of safety to its employes. The contest initiated by Rock Products should be the means of our developing much useful information.

Foreign Abstracts and Patent Review

Italian Cement Standards—The Italian cement standards, which became effective on September 6, 1927, were replaced with new standards on June 7, 1928. The distinction between natural cement (cemento naturale) and artificial or portland cement (cemento artificiale) has been stressed further; and the distinction between high grade and trade cements (cements of first and second quality) has been dropped; and in its stead the minimum compressive strength of standard mortar of 1:3 proportion after 28-day water storage has been raised from 250 kg. per sq. cm. (3556 lb. per sq. in.) to 280 kg. per sq. cm. (3983 lb. per sq. in.). The directions for the preparation of test samples and for testing and those for supervision of the cement plants remain unchanged. The Ministry of Public Works reserves the right, at the expense of the state, to send its engineers into the cement plants to obtain a cement sample from each bag and test it according to standard regulations at the Royal Testing Institute in Rome. The cement plant has the privilege of having a second test made if the first test does not appear satisfactory. But if the second test shows also cement of inferior quality, the cement plant is warned or fined up to 10% of the value of the monthly production; this fine is doubled if the manufacturer is caught a second time, and if it is a third time, the plant is shut down for three to six months. All cements must be delivered in original bags of 50 kg. (110 lb.) weight, tied with a string and provided with a metal seal bearing the name of the cement and of the firm. In the case of slow-setting cement a plate of cardboard and strong linen is to be provided with the metal seal, on which it is stated whether the cement is natural or artificial, and the minimum strength of a standard mortar of 1:3 proportion after 7-day storage, the minimum strengths to be no less than as follows:

	Strengths: kg. per sq. cm. (lb. per sq. in.)	
Test	Compression	Tension
7-day	180 (2560)	18 (256)
28-day	280 (3983)	22 (313)

If the bags are specially packed and sealed, the data must be printed on them. These regulations apply to all imported as well as to the domestic cements. The SO_3 content must not exceed 1.5% and the MgO content 3%. A purchaser of cement may return the same to the original owner within 50 days after shipment was made, if an authorized agent finds its quality inferior. The following standards apply to the acceptance of cement:

	% residue on screen		Minimum specific	Setting period in hours		Minimum strengths: kg. per sq. cm. (lb. per sq. in.) Tensile after days:		Compressive after days:	
Cement	900 (metric)	4000 (metric)	weight	Start	End	7	28	7	28
Hydraulic lime	7 (metric)	25 (metric)	2.7	2-6	8-48	....	5* (71*)	....	25* (356*)
Strong hydraulic lime	7 (metric)	25 (metric)	2.7	2-6	8-48	....	8* (114*)	....	50* (711*)
Rapid setting cement	15 (metric)	....	2.8	1/60	½	12† (171†)	120† (1707†)	....	....
Slow setting cement	2 (metric)	20 (metric)	2.9	1	6-12	18* (256*)	22* (313*)	180* (2560*)	280* (3983*)

*Test samples of 1:3 standard mortar. †Test samples of standard mix. Values for water storage.

Chemical Resistance Ability of Cement—A controversy between Curt Pruessing and Dr. Gruen, in which the latter states that the subject of the controversy is, concisely stated, the following question: "Is it possible to make a salt-water-resistive cement out of iron ore cement by grinding this iron ore cement with blast furnace slag?" Gruen maintains the affirmative and Pruessing the negative. *Zement* (1928) **17**, 26, pp. 1006-7.

Water Glass as Cement Admixture—R. Gruen reports from the research institute of the German cement industry that occasionally the admixture of water glass to the makeup water of mortars has proven suitable for accelerating the setting period. But seldom has water glass been used as admixture to the cement being ground; and therefore it was desirable to test the influence of water glass upon the strength of cement and the resistance of cement to salt water if it is admixed to the burned cement and then entered into the mortar. The difference of effect was also determined of (*a*) the raw not yet dissolved and therefore difficultly soluble water glass and (*b*) the water glass discharged from the solution in steaming, therefore easily soluble water glass. These two kinds were added finely ground in 5:10 proportion to cement, using standard sand in the mixture. As a control test, ground standard sand was also tested in place of the water glass. The test series thus being as follows:

Cement	Admixture	Standard Sand
100	5 standard sand powder	300
100	5 raw water glass powder (a)	300
100	5 dissolved water glass powder (b)	300

A portland cement and an iron cement were tested, the test batters being stored in water, magnesium sulphate, acetic acid, and in linseed oil. The test data showed that the course of hardening of the two cements is influenced but little by the water glass admixture and in general there is a slight decrease in strength. When storing the test batters in magnesium sulphate solution, aggression on the portland cement was not stopped by the admixing of water glass; on the contrary, the dissolved water glass acted outspokenly unfavorable in that it accelerated the aggression. Iron cement without admixture of water glass showed no decrease in strength; and with admixture of water glass showed an initial decrease of strength, but regained this loss later. The water glass did not increase resistibility to acetic acid; and when admixed to iron cement to the stored in linseed oil, the results were unfavorable, the cements without admixture of water glass keeping better. When making the cements into concrete, a difference in the imperviousness to water could not be determined. These results tally completely with those of Haegermann (See *Zement*, 1925, p. 795). Resistance to salt water decreased more when using dissolved water glass than when using raw water glass. It is therefore not recommended to add powdered water glass to the mortar.—*Zement* (1929) **18**, 7, pp. 192-4.

Survey of the Literature on the Constitution of Portland Cement Clinker—In following up the articles in Nos. 22, 29, 30, 32, 39, 41, 42, H. Richarz supplements with a summary of the recent literature on the above subject.—*Tonindustrie-Zeitung* (1928) **52**, 53, pp. 1078-1081.

Variable Hardening of Portland Cements—Max Gensbaur replies to H. Kuehl's article on this subject (*Tonindustrie-Zeitung*, 1928, No. 43), stating, besides his theories on the action of clinker in storage, that portland cement clinker which suffers from free lime may be made entirely consistent in volume to a certain degree by boiling and leaching in water. He considers it exceedingly urgent that the results of clinker storage be attacked at their source, in the cement plant. Perhaps experiments with clinker of kiln temperature and of clinker stored for several months, and also with newly ground cements, and such that have been stored for several months, would point the way; thus far there is no direction whatsoever concerning the period of storage of clinker, or of the period of storage of cement in bins.—*Tonindustrie-Zeitung* (1928) **52**, 99, pp. 1976-1977.

Process for Granulating Fused Blast Furnace Slag—An horizontally located rotating conical drum provided with steel balls in the manner of the well-known ball mills, is supplied at the open face with a flow of slag and the necessary quantity of water. The quenching of the slag, which

takes place thereby, is aided by the sizing effected by the grinding of the balls, whereas due to the energetic whipping of the contents of the drum the formation of veils of steam around the glowing particles of slag is forestalled, and thus the disturbing influence of the Leidenfrost phenomena eliminated. The sizing work of the balls prevents also the development of the slag sponge, which floats upon the water, absorbs therefore but little water and cools slowly. By suitable control all water supplied may be evaporated, so that the slag discharges completely dry and well sized.—*DRP.* 465,084 of 23.4.26. Cl. 80b.

Process for Light Concrete—The process consists in the use of all kinds of shells, especially sea shells, which must be nonbroken, and receive no special treatment, as aggregate in the concrete in order to assure cavities in the structure, which is of economic advantage in construction work on islands and along sea coasts.—*DRP.* 464,817 of 22.9.26. Cl. 80b.

Standards of German Sand-Lime Brick Industry—The standards set for the Association of German Sand-Lime Brick Manufacturers, who supplied a demand of 500,000,000 brick in 1926 and of nearly $1,000,000,000 in 1927, require a compressive strength of at least 150 kg. per sq. cm (2133 lb. per sq. in.) for air-dried brick, and the water-absorption capacity must not be less than 10% of the weight. The brick is thus tested for compressive strength and for water absorption in respect to both weight and volume of the product. Since lime is an important item in this industry, standards are being worked out for lime.—*Zement* (1928) **17**, 39, p. 1457.

The Chinese Cement Industry—The demand for cement in China cannot be met by the domestic cement plants. Japan supplies about one-half of the imported cement, but recently has erected cement plants in the Kwantung territory to supply a portion of the Chinese market. The actual production capacity of six present plants (including the Portuguese plant at Macao and the British plant at Kowloon) is 2,700,000 bbl., and none of these plants carry cement in storage. Two plants that have been under construction for several years are now ready for operation. The China Portland Cement Co., Ltd., was founded in 1921 by the then director, Yas Sing-kee; while the administration is located in Shanghai, the plant of 400 bbl. capacity per day is located at Lungtan, 34 km. from Nanking, where thick layers of loam covering an exceptionally pure limestone assures two products on the spot for making an excellent cement, as tests have proven. The Shanghai Portland Cement Co., Ltd., was founded by Liu Hongsow in Shanghai and the plant located between the Soochow creek and the Whangpoo river has a capacity of 1200 bbl. daily. In spite of these two new plants the imports will undoubtedly increase.—*Zement* (1928) **17**, 36, p. 1364.

Contribution to the History of the Swabian Gypsum Sales Office—A review of the development of the gypsum industry in southern Germany, which dates back 200 years and which has been consolidated from many small plants into a few large concerns with a central sales office. As yet foreign countries can import gypsum without import duties, but it is urged to establish a protective tariff in order to protect the German gypsum industry.—*Tonindustrie - Zeitung* (1928) **52**, 57, pp. 1156-1158.

The Utilization of Heat in Shaft Lime Kilns—Kutschera abstracts data on the various burning processes from the Report of the U. S. Bureau of Standards on the Manufacture of Burned Lime in the United States (Circular No. 337) and states in conclusion that even though the heat balance presented does not permit an absolute comparison because of the differing quantities of production due to the design of the kiln, one concludes nevertheless from the heat efficiency test of the kiln plants the economical superiority of producer gas as a fuel as compared to direct coal-firing. The economical advantage is based principally upon three essential factors: Adaptation of the gas, in that the fire is supplied to the spot where it is needed at the moment; use also of a coal of inferior quality, and, thirdly, lower operating costs, especially when feeding coal automatically to the generator. The initial higher installation costs are amply compensated by the advantages.—*Tonindustrie-Zeitung* (1929) **53**, 4, pp. 65-67.

Process for Making Mixed Cements—In this process alumina cement is an essential constituent not only in quantity but also in ability to act as exciter. A surprise in this new process is the fact, known for the first time, that considering certain requirements alumina cement can be mixed with desirable other mortar binders containing silicic acid and that thus may be obtained a favorable behavior of the mixed product, in many cases even a high-grade cement. The fundamental principle of the new process is that on the one hand alumina cement, on the other hand portland cement with the addition of a substance which is able to fix the free lime, is made up into a mixed cement. Any other mortar binder may take the place of the portland cement. The free lime fixing substances are understood to be silicic acids capable of binding in some form, and hydraulites equivalent to them. On the other hand, one thinks of aciduous salts which fix with free lime, as for example precipitated silicic acid, silica substances, kieselguhr (diatomaceous earth), trass, pozzolanas, tufas of all kinds, pumice stone, ashes and slags of every source burned clay, oxalic acid or other weak acids or weak aciduous salts. These admixing substances may be taken either individually or together as mixes. Such salts and admixing substances may also be added which are able to form double compounds with lime. Of special importance for the new mixed cement are the blast furnace slags. One form of the mixed cement would consist of alumina cement, blast furnace slag of some kind and a lime fixing admixture. A special form is presented by the mix of alumina cement, portland cement and aciduous blast furnace slag. And especially unique is the form in which basic blast furnace slag takes the place of portland cement, giving mixed cement of alumina cement, basic and aciduous blast furnace slag.—German Reich Patent 464,175 of 14.2.25. Cl. 80b. Dr. G. Haegermann, Berlin-Karlshorst—*Tonindustrie-Zeitung.*

Fine Sand in Concrete and Cement Mortars—According to the Russian standards for concrete and reinforced concrete constructions, there exists a coarse sand having grains of 5 to 2 mm. diameter (1 mm. is 0.03937 in.) and a fine sand having grains of 2 to 0.25 mm. diameter. A mixture of 1 : 1 proportion of coarse and fine sand is considered best for maximum strengths in mortars and concretes. Of sand having grains less than 0.25 mm. in diameter, only a maximum of 10% is admitted. A series of tests have been made and are being continued at the construction engineering laboratory of the Higher Technical School of Moscow with cement mortars and concrete mortars having aggregates of sands of different grains and proportions and with or without certain percentages of powdered sand, in respect to their compressive and tensile strengths after a certain number of days, as compared to the strengths obtained with mortars obtained according to standard directions. When powdered quarts was added up to 2 weight parts, to mortars of 1 : 4 and 1 : 6 proportion, the tensile strength attained after 90 days was considerably greater, exceeding by far that of mortar 1 : 3 having no addition of powdered quartz. The mortar 1 : 6 proportion showed, when adding 1 weight part of powdered quartz, after 90 days an increase in compressive strength, whereas the mortar of 1 : 3 proportion and without powdered quartz admixture not only showed no increase, but even an inclination to retrogress in strength. Tests with the sand from various river beds showed that this natural sand with a content of powdered sand of more than 5% showed better test results than standard sand prepared from this same sand. According to the tests, the admittance of 10% of sand having grains of less than 0.25 mm. in diameter, as proposed in the standards, is not to be considered as detrimental, at least in some cases. Furthermore, the initial removal of the powdered sand will not always be a suitable precaution. If the content of powdered sand in the sand is greater than admitted by the standards, it is recommended that the sand either pass a screen or sand of a better grain composition be added, the proper condition being arrived at by trial tests. A shortage of the coarser grained sand, that is particles of 5 to 2 mm. diameter, has an unfavorable effect upon strength.—*Tonindustrie-Zeitung* (1928) **52**, 66, pp. 1347-1348.

Cement Mills in Chesapeake Region Study Safety in Washington

AT THE LEE HOUSE, WASHINGTON, D. C., an enthusiastic group representing the cement mills of the Chesapeake region met on April 2 to study recent developments in accident prevention and plans for improving safety conditions in their plants. The occasion, sponsored by the Portland Cement Association, was the seventh regional safety meeting of cement mills to be held so far this year.

The chairman was William Moeller, general superintendent of the eastern division of the International Cement Corp., and for many years an interested and active member of the general committee on accident prevention of the association. Mr. Moeller was assisted in conducting the meeting by Maj. Henry A. Reninger, president of the National Safety Council, who conducted the round table discussion, and Daniel Harrington, chief engineer of the U. S. Bureau of Mines, who led an interesting discussion of first-aid training.

Wm. Moeller

The program was as follows:

MORNING SESSION

"Safety Progress in the Cement Industry," A. J. R. Curtis, Portland Cement Association.

"How to Sell Safety to the Employes," A. R. Couchman, safety director, North American Cement Corp.

"Eliminate Small Accidents and the Big Ones Will Stop," G. F. Martinez, superintendent, Lone Star Cement Co., Virginia.

LUNCHEON

Chairman, A. R. Couchman

Address by O. J. Smith, chief rating engineer, U. S. Casualty Co.

AFTERNOON

"First Aid and Safety," D. Harrington, chief engineer, safety division, U. S. Bureau of Mines.

Round table discussion conducted by Maj. H. A. Reninger (Lehigh) and led by the following:

H. H. Leh, superintendent, Lone Star Cement Co., Pennsylvania; "Quarry and Crusher Accidents."

George S. La Forge, Lehigh Portland Cement Co., Union Bridge, Md.; "Mill Accidents."

Wm. M. Powell, safety director, Medusa Portland Cement Co., Cleveland, Ohio; "Power and Electrical Hazards."

H. A. Johnson, superintendent, Lehigh Portland Cement Co., Fordwick, Va.; "Packing and Shipping Accidents."

E. S. Guth, district manager, North American Cement Corp., Hagerstown, Md.; "Railroad and Yard Accidents."

DINNER

Toastmaster, Dwight Morgan, vice-president, Lone Star Cement Co., Virginia.

Address, Col. G. B. Strickler, consulting engineer, Washington, D. C.

Records Show Opportunity to Improve

A. J. R. Curtis' paper, which opened the morning session, was in part as follows:

"As a group vitally interested in reducing personal injury accidents in the cement mills, we have a big job ahead of us ,perhaps more difficult than anything we have faced in the past. While the cement mills of America are making a wonderful record so far as the reduction of accident frequency is concerned, there are beginning to appear unmistakable signs of an increase in the severity of our accidents.

"The number of cement-mill accidents has declined so precipitately that the record has become both outstanding and spectacular. Our average monthly accicent rate for the entire group of mills reporting to the association has declined from 261 in 1924 to 88 in 1928 and for the first two months of 1929 it was only 52. But what is that going to avail us, if the severity of our mishaps, in terms of days lost, permanent disabilities and death, goes up? This is exactly what is happening. I want you to appreciate and to become fully alarmed at this trend. It means that the character of our accidents is changing. It seems to tell us that while we have succeeded in raising the level of intelligence to the point where men are avoiding the less dangerous types of accident, there is yet a tremendous task ahead of us to educate the workmen away from accidents which lead to the more severe injuries.

"The situation which seems to be ahead presents a challenge to every superintendent, safety director and foreman. There is no opportunity for you to offer an alibi. There can be none. As accident preventive alibis are of no account anyway. The level of intelligence in our operating organizations simply hasn't been equal to the demands placed upon them by a heavy program of new construction and rebuilding, new and sometimes larger machinery and the necessity for producing more cement per man-hour, forced on our industry by stern economic necessity.

"None of these obstacles to our safety progress can be changed. They represent the trend and the pace we must expect in the future. Therefore the solution of our difficulties lies altogether in improving the personnel of the mills. Those things which will develop general intelligence, broaden men's viewpoint and stimulate their interest in their work and their own progress, must be depended upon in our efforts to cut the severity of our accidents.

"By pleasant contrast with what I have just said, as applying to the mills of the country in general, I know you will appreciate a few words in explanation and praise of the good being done in the five mills which constitute this local group. In 1924 the three mills in this group then reporting suffered 74 accidents. In 1925 they reported 53 and in 1926, 40 accidents. In 1927 four mills in this group reported 10 accidents and in 1928 five mills reported 14 accidents. These 1928 figures average 2.8 accidents per mill as against 7.3 accidents per mill for the 144 mills which participate in the association's accident reporting system the country over.

"The records of the mills in this vicinity are so good that nothing short of two or three trophy winners will be satisfactory in 1929. Already one of these mills, the Lone Star at Norfolk, has completed a year without loss of time and would have received the trophy except for an eye accident on which a possible slight permanent disability was acknowledged and compensation paid. A little more study and deliberation and a little more patient care is all that will be needed to win some trophies, as the mills of this group have already demonstrated that they know how to attack the accident problem and it is most decidedly on the run."

How to "Sell" Safety

A. R. Couchman, safety director of the North American Cement Corp., spoke as follows:

H. A. Reninger

"Any number of theories have been propounded as to show safety can, or should, be 'sold' to the employe. I believe, the difference of opinions on this subject are due mostly to local conditions, which are affected by the different types of individuals that are employed. Those that have been actively engaged in safety work have learned that the human element is rather a delicate problem to handle, especially in organizations where so many types of individuals are found. Some industries have been successful in eliminating accidents by a certain procedure,

while others have been successful along other lines. From past experience, I believe the majority of us will agree that the success of any organization, with regard to safety, is through educational efforts. Success, however, in this connection depends entirely upon the methods pursued in applying this education. Speaking in terms of selling safety—when you sell anything, before the sale is consummated, you must convince or educate the prospect to think as you do. It is therefore, essentially important that we think right before we try to sell the employe or we may sell them on the wrong idea. When we speak of selling safety we must not lose sight of the fact that after all it is only a form of education. I think if we were to check our past performances, we would find many instances where the employe has been wrongly sold; they have not been made to understand just what it is all about. I was talking with an employe recently, with reference to a minor injury. He said, 'What difference does it make how many minor injuries I have—as long as I do not lose any time.' I wonder how far that impression goes in the industries that are trying to get safety across and reduce accident waste. You will find many employes are susceptible to the teachings of safety, but if they are not applied effectively, you will not get the results that are expected.

"I think it is possible to build up a successful safety organization, even to the point where accidents can be practically eliminated. Selling safety is the first step towards this end. The cement industry as a whole has made wonderful strides in accident prevention. Our big problem, however, remains to be solved and that is how to keep up a perfect record after once acquiring it. It has been said that labor turn-over has been one of the chief causes. I am inclined to believe that labor turn-over does not enter into it to any great extent. I recently went over the records for several mills and found that 85% of all accidents occurred to men that were employed one year or more, and in some cases as the service record of certain individuals increased, their accident frequency also increased. I have also heard it said, that we must have a certain amount of good luck, along with our safety activities, to get anywhere. I think all of us have had good luck but we have failed to look upon our good luck in the nature of a warning. For instance, if an employe has an accident from the performance of an unsafe practice and no injury resulted from it, and steps were taken to eliminate a future occurrence, then I think that is good luck turned to practical account in accident prevention; but if the unsafe practice is disregarded and sometime in the future the same employe has an accident that results in injury, then many of us would wrongly blame bad luck as the cause.

"To successfully sell safety to an organization we must have properly trained foremen. They hold the secret of getting it across. However, we cannot expect all our foremen to be the type to put safety across as it should be; foremen like other individuals are not all alike. It is necessary to train foremen and sell them on safety. Some foremen are natural leaders and need very little training. Foremen should be impressed with the idea that they represent a capital investment and there are certain things expected of them, not only from the standpoint of production, but of safety to men and equipment as well.

A. R. Couchman

"For instance, the foreman who is earning $250 per month should be taught to realize that he is earning 6% on $50,000 which may be regarded as the company's investment in him. While this may seem rather a radical way to compare the value and connection of the foreman with accident prevention, still on the other hand, I think from the viewpoint of the foreman, accident prevention should be considered a business proposition. Within the next decade we will have learned that accidents can be scientifically controlled and we are going to find ourselves budgeting production with accident control. The foreman who has taken this viewpoint and feels that he is morally responible for his men is going to be successful in controlling departmental accidents. As I said before, the foreman is the most important factor in selling safety to the employe.

"There are five factors, as I see them, in selling safety to the employe. They are, approach, attention, interest, conviction and desire.

Approach

"I will not attempt to suggest how you should approach the employe on safety. However, every man should be reached either verbally or otherwise. The factors of selling following approach are the most important.

Attention

"Following approach you must command attention. I say command because only a certain percentage would respond voluntarily to the things you were trying to put across. Attention next to desire is the most important of the five factors. It is with this factor that you form the foundation of your campaign and is essentially necessary in making it a success. To claim attention you must get the employe to think—to concentrate on the things you are trying to put across.

Interest

"The next important step is to create interest. You may say after enforcing certain rules the employes would not become interested, but they will, and you will be surprised to note the precautions they will take not only in trying to prevent personal injuries but to fellow employes as well. To maintain interest it is necessary to have some form of competition and possibly recognition on the part of certain individuals who have shown unusual interest towards the advancement of safety. I think it unwise to offer cash prizes because it only establishes a precedent that may become embarrassing in the future. One of the ideal ways of creating interest is through the plant accident records. First of all the records should be complete. To do this it is necessary to have all injuries reported regardless of their nature, not only to the foreman but someone else designated for that purpose. It has been said that it is impossible to get all minor injuries reported. There may be some exceptions but I think it can be done.

Conviction

"The fourth factor of selling safety is conviction. This is made possible in some cases by the reaction from the effects of the first three factors. However, sometimes it does not work out this way. We may have some employes who have become interested in safety but are not concerned or convinced of the real benefits derived therefrom. In this connection, however, time will adjust unusual cases. I remember a short time ago one of our employes came into the office to show me how a pair of goggles saved his eyes. When we first approached this man on eye protection, he raised a howl—and could not see the necessity of it and of-

fered all kinds of excuses. He was one of the low type with a dead subjective brain, but we developed that brain to the extent that the man was convinced that we were right, and the rule that was made was after all for his mutual benefit.

Desire

"The fifth and last factor in selling safety is desire. Some employes can be sold 100% on the other four factors, and yet do not have the desire. Very often we work hard to get our organization over the top, but apparently only reach a certain stage and stop there. There is where your foreman and safety directors have a real job on their hands. It is easier to sell employes safety than it is to keep them sold. We, therefore, cannot afford to pass up a single day without checking up on unsafe practices and speaking to someone about safety. It does not matter how well we have our employes sold, occasionally we find someone unconsciously, not carelessly, performing unsafe practices. As I said before, it is impossible to make rules that will cover every phase of work."

"Eliminate Little Accidents"

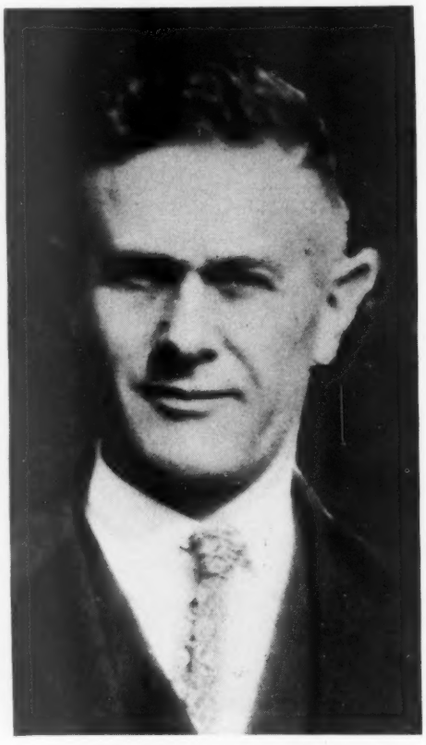
G. F. Martinez, superintendent, Lone Star Cement Co., Virginia, said:

"What I have to say to you is nothing new; it is merely emphasizing something you already know in safety work, and that is, concentrating on the elimination of little accidents. When a plant organization gains control over little accidents they have found one of the main keys to the problem of accident prevention.

"'Eliminate little accidents and the big ones stop' is the slogan we have adopted at our Norfolk plant. For the last six months we have been endeavoring to build our safety work around this slogan and have accomplished some very interesting results.

"It was our experience for a long time at the Virginia plant, and probably that of many other plants, to construct our safety program around the larger accidents and lost-time accidents and neglect the little accidents, the object being to get by without a lost-time accident. This is demonstrated by the various types of safety programs at many of the plants for recording and picturing the lost-time accident, but there are no charts or records picturing the little accidents. It is now our belief that we should go several steps further and endeavor to stop accidents long before a serious accident situation arises by nipping them in the bud, as it were. If a community is fighting smallpox, they don't wait for the disease to first take hold of the victim and then vaccinate, but they vaccinate first.

The object therefore of a successful safety program should be to vaccinate first, get it across to the organization and the men to work for the ELIMINATION OF LITTLE ACCIDENTS and all causes for little accidents. When this is done there is bound to be an improvement in accident conditions with a big reduction of serious and lost-time accidents. To illustrate this briefly, many of you gentlemen have had some experience in the tropics or know something about them. One's first thoughts on going to the tropics are to make provision against the large insects and animals we expect to meet there. No thought is given to the



G. F. Martinez

little fellows. However, after a few days in the tropics, one quickly forgets the large insects and devotes his whole attention to the little bugs. It is the little bugs that raise the havoc. Now in safety work we have the same situation, the tendency being to look at the big accidents but it is the little accidents that are really raising the havoc. If we can put our attention on little accidents and reduce them, the serious ones will soon stop. Furthermore, an accident whether little or big, is an accident and for every serious accident there are two dozens of more minor ones. It is only the degree of an accident that classifies it as minor, serious, or lost time. Also we all know the factor of safety on many an accident classified as 'No Lost Time' is too small for comfort. Some may ask what is a minor or serious accident; minor accidents with us are those requiring first aid treatment only; serious accidents require a doctor's attention; and a lost-time accident unfortunately classifies itself.

"About six months ago the Norfolk plant adopted a plan stressing on the elimination of small accidents and the results accomplished so far are very interesting. In our organizations of 140 men we have reduced the number of accidents per month from 20 to 25 (which includes every variety of accident serious enough to report) to 6 or 7 minor accidents. Since last October to date, a period of half a year, we have had just one accident serious enough to require a doctor's attention. Previous to this it was nothing to have the doctor at the plant several times each month.

"We all know that no plan of accident prevention is infallible, but we do believe that some methods work better than others, accounting for the great variety of safety results at the various plants. Also a good safety program, like a good business program, should settle down to steady plugging and should enter into every man's daily work with the spectacular left out.

"As we believe the little accidents, or causes leading up to little accidents, are the seat of all the big accidents, we have tried to develop a safety program at Norfolk that harps on the little accidents. How this ought to be done is an individual matter that should be worked out by each plant or organization an an operating program is developed. Methods applicable to one plant may not be at all suitable to another. Also the development of a safety program is evolutionary. Whatever program is developed the objective should be to—

First

"Devise a plan that will not permit the slightest accident to get by without serious comment and endeavor to prevent a repetition.

Second

"It must get across to every man so that every day in every way the whole force will be constantly striving to eliminate the little accident.

"The message which I have tried to get across to you today is to CONCENTRATE ON THE ELIMINATION OF LITTLE ACCIDENTS AMONG YOUR WORKMEN. Little accidents happen so frequently that it keeps the safety work pepped up by going after them and don't forget if you ELIMINATE LITTLE ACCIDENTS THE BIG ONES STOP."

Prevention of Quarry and Crushing-Plant Accidents

H. H. Leh, superintendent, Lone Star Cement Co., Pennsylvania, said:

"I desire to bring you congratulations from cement plants located in the district which carries the tradition of the beginning of the portland cement industry in

this country—the Lehigh Valley—and you have our wishes that your safety records this year will far surpass those of previous years.

"In years gone by we were inclined to believe that the various departments in their regular course of operation had to have a certain number of accidents each year. But this old theory has been so thoroughly exploded that we have an entirely different conception. Records show that some of these departments have gone three years or more without an accident, which brings up the question, "Why can this be accomplished in some cases and not in others?" The operations are all more or less similar. Therefore, I shall cover a few points which to my mind are reasons for failure in some plants. To do this, let us proceed in the usual sequence of operation.

Stripping and Drilling

"Stripping should be carried back of the edge of the face, and kept a safe distance, 100 ft. is not any too much, so as to prevent loose dirt and rocks from slipping and rolling over the edge and thereby be the cause for some fragments of rocks falling down the face into pit.

"Primary drilling is a comparatively simple operation; however, special precautions and thorough examinations should be made of the nature of the rock to be drilled and all crevices, faults, and, naturally, the burden of the proposed blast should be studied before deciding as to the spacing of the drill holes. I am inclined to think we frequently go by previous experience and routine in spacing of holes rather than by a careful study of conditions as they actually exist. When drilling, if unusual conditions are encountered they should be noted, such as clay, seams, extra compact or loose rock, depth of water, if any. Later on all such knowledge will be highly beneficial in determining the proper strength and amounts of explosives to use in the various holes, as unusual blasts are always dangerous and uneconomical.

Blasting, Loading and Handling of Explosives

"These operations may sound very dangerous but they are not if certain definite precautions are carefully observed. We have become so accustomed to consider this extremely dangerous and, consequently, from necessity, have observed these safety rules so carefully that we do not have the number of accidents we formerly had. But we still have some very deplorable accidents in blasting. The first point to consider in the use of explosives is their storage. As we have the 'American Table of Distances' and approved proper designs to go by in the location and construction of magazines, this part should be easy, but when we have proper storage, we should have a competent man in sole and complete charge of magazine and stock, which should at all times be kept locked. Cases should be neatly piled proper side up as marked, oldest stock always moved out first and the floor kept clean and free from grit, and especially should all metallic materials such as shovels, picks, etc., be kept entirely away from magazine. Needless to say fuse and exploders should be stored a considerable distance away from main magazine.

"Roads for the transportation of the explosives from the magazine to quarry should be kept in good repair. It is safe to haul explosives in a clean conveyance over a good road, but ruts and obstructions produce hazards. If men must carry the explosives, the same thing applies. Be sure they have a good, clean, even path. A man carrying 50 lb. of high explosives certainly needs sure footing.

"In loading there should be allowed plenty of time so there is no need of rushing and the entire job should be directly under the supervision of a competent man who has had ample experience and thoroughly knows the work and the practuations to be followed. The entire loading crew should know exactly what each man's duties are and the work done in an orderly and precise manner. No smoking or fires of any kind should be allowed at or near scene of operation. The carrying of any matches in clothing of the loading crew should be absolutely prohibited and all strangers should be kept away.

"The surface surrounding the blast holes should be kept as even as possible and, under no conditions should any metallic materials be lying around. Cases should always be opened with wooden tools, and the shells should closely fill the size of the holes. If cartridges are slit with knife, it should be a very dull one and the slitting should be done very carefully and slowly.

"Do as little tamping as possible and then only with wood tamping sticks, being careful not to injure blasting cap wires or the cordeau.

"For stemming there is nothing better and safer than dry, clean, free running sand, as this will not require any tamping. Never connect wires or cordeau until just prior to the actual time of blasting, and certainly never connect any blasting caps or exploders to main lines until everyone is in the clear.

"It is known that wires lying on the ground will collect enough static to set a blast off without any other means. Remember that it takes but 0.4 ampere to set off a blasting cap or exploder. Always use good, clean insulated wire with clean and properly made tight connections. We prefer cordeau as we think it is safer and chances of misfire are practically nil.

"Take time to do all of the work carefully and systematically, then make a final inspection of all lines and connections before finally connecting the lead lies to the source of current.

"In secondary blasting provide two wooden, sheet-iron covered magazines to hold just enough for one day's supply, the explosives and exploders to be stored separately, each in its own respective magazine. Also, provide two covered wooden boxes, one for explosives, another for exploders and fuse, for the blaster to carry his supply from the secondary magazine to the scene of operation and back.

"When firing a multiple of secondary blasts simultaneously we prefer to use fuse and exploders rather than a battery because the number of explosions can be counted and thereby can be determined a misfire, which can then immediately be corrected before men return to work. However, be sure to give the exploders time enough to go off, before returning to investigate. This is obvious but it has caused many accidents.

"Another precaution when using fuse and exploders is to place a cap and the same length of fuse that will be used in the actual shot, same to be fired at or near point of shelter immediately before the blasters go to fire the secondary loadings. Then, when this exploder explodes it is the signal for the blasters to immediately return to the shelter, regardless as to whether or not all the secondary charges have been fired. Provide the proper kind of sheet iron shelter houses for all the men that remain in the quarry during secondary blasting. In making primary blasts all men should be removed from quarry to a safe distance and shelter.

"Should explosives or exploders become damaged the manufacturer will be glad to take care of the proposition of destroying them, and finally, be sure to keep all blasting materials and supplies out of the hands of irresponsible persons and especially children.

"All magazines, both primary and secondary, as well as wires, exploders, fuses and cordeau should always be kept locked, even the carrying boxes, except at exact time of usage. The keys to same should be in charge of one responsible person, whose duty it is to see that such instructions are carried out 'to the letter.'

Inspection of Face

"After blasting, especially after primary blasting, comes the inspection of the face of quarry, which I consider one of the most necessary parts of a successful 'No-Accident Quarry Operation,' as there is always danger of fragments of the blast remaining in the face, which to all appearance may seem safe but has so often proven unsafe. The foreman should be on the floor of the quarry, to call atten-

tion to dangerous hanging rocks, which are usually found to the right and left of the holes that have recently been fired.

"The use of long, slender poles is helpful if the loose rocks can be so reached. If not, a man should be let down on a rope and a substantial harness, to carefully remove all traces of such danger. This must be carefully watched at all times, but especially so in the spring of the year, when alternate thawing and freezing has a tendency to dislodge rocks that a short time before appeared perfectly safe. Even the action of well drilling has caused rock to fall out of face.

Shovels and Other Equipment

"The proper guarding and maintenance of shovels is the best preventative of accidents at or near shovels. Proper inspection of chains and cables weekly, in addition to the daily inspection of boom, dipper sticks and dippers for loose nuts, bolts and parts is necessary. All pulleys and sheaves should be of size and design to sustain the maximum load for an indefinite period. All bolts in sheave wheels, etc., should be provided with cotter pins turned over to prevent the nut from coming off the bolt.

Loading

"The proper loading of cars is a very important operation from a safety standpoint. Improper loading or overloading of cars may allow rocks to fall off same while in transit to the crusher, which may mean a fractured skull, a broken limb or smashed fingers or toes.

Transportation

"It appears to me that we have entirely too many accidents caused directly or indirectly by our quarry or rock transportation systems. Here, again, I feel that proper maintenance is the solution. Tracks must be properly laid and maintained with rails of sufficient weight to handle the equipment without becoming surface bent and out of line, curves not too short, a good quality of switches and points, good substantial ties and of sufficient number to properly support the rails, and the suitable amount and location of derails.

"Riding on cars or locomotives by anyone except the right person at the right time should be absolutely prohibited. Engineers and brakemen must have the intelligence to thoroughly understand all signals.

Inclined Planes

"Perhaps the two main causes of accidents at planes are rocks falling off cars and hoisting cable failures. The former can be prevented by careful loading and protection at and near plane by means of guards, which will keep men away from the range of falling rocks and by allowing no one to ride out of the pit on cars. The latter requires careful and proper inspection of wire hoisting cables weekly, and records of such inspection to be kept in a book provided for that purpose, which inspection should also include the test run every morning, at which time the cable should be called upon to sustain the maximum load to be hauled out of quarry throughout the day with a factor of safety of at least 2.

"This weekly inspection and tests should not only include wire cable used on inclined planes but cover wire cable used on shovel; also, shovel chains, and all other chains used around quarry. Careful inspection should also be made of electric feeder cable to shovels, drills, etc., as these are frequently injured flying rocks and should include careful and frequent inspections of all cars and engine couplers and devices.

"In addition to this the points of vision of various persons stationed at certain locations should be carefully observed. It is essential that all signals—hand, mechanical or electrical—should be thoroughly understood by the entire quarry personnel, since often, if a signal is not observed by the party directly concerned, it may be noticed by some one else and thereby an accident avoided.

Crushing

"The most frequent cause of major accidents at and around crusher, I believe are usually caused by trying to feed rocks entirely too large into a crusher too small to handle them. This can, to a certain extent, be eliminated by the proper preparation of the rock by secondary blasting and the use of certain size dippers on shovels so as to allow only the proper size rocks to go into the cars. If this should not be practical, then the shovel operator should be thoroughly educated as to the maximum size of rock that the crusher will handle, and all that are too large should be laid aside for future preparation.

"Another material help at the crusher to handle large rocks is a quick acting air or electric lift with a proper hook always suspended about crusher. In any event, crushers should have a guard entirely around them at least 36 in. high. Men can use a bar over such a guard and still be protected from falling into crusher. If necessity compels a man to go within the guard he must wear a life belt attached to life lines. Life lines should be of such length as will prevent the persons using them from being drawn into the jaws of the crusher or from being sucked under by a sudden rush of materials. When crushing machinery is stopped for the purpose of making repairs, the person making such repairs should hold the key to the electric circuit to prevent the machinery being placed in operation by mistake. All rock elevators should be equipped with a safety backrun brake so as to eliminate any chance of the elevator reversing itself, due to the load therein contained.

"We are getting larger crushers and automatic feeders, which are eliminating the main cause of previous crusher accidents, and incidentally we are getting better efficiency and corresponding lower crushing costs.

General

"Years ago when we loaded rock by hand we employed the very poorest kind of labor and only required that they were able to break rock with sledges, load it on cars and, probably, know how to drive a mule; but today with high speed electric shovels, fast moving dinkeys and cars, automatic car dumps, mammoth feeders and crushers, it is necessary that we employ more intelligent labor in the quarries. I fear that many of us have improved mechanical equipment but have failed to improve our organization by proper education.

"When employing a new man be sure that he is fully instructed as to his work. I believe that the proper method is to instruct him as to the hazards that may exist and then as to the nature fo the work, and if necessary have another man with him until he thoroughly understands his duties.

"Orders should be given in a clear, concise manner so by no chance the man receiving them can fail to thoroughly understand them. I believe that very many accidents are caused by orders being carelessly given, and we should, probably, to some extent, educate our foreman to give definite and thoroughly understandable orders.

"And lastly, what I consider the most important point in decreasing accidents, especially in quarries, is good housekeeping, orderliness and cleanliness. All materials in and around quarries should be carefully placed or piled in a precise orderly manner. How can we expect men to work safely if we have rails, ties, shovels, picks, rope chains, cables scrap and what not lying around in disorder all over the entire quarry, and especially loose rocks covering the floor and along tracks, etc.? It may, at times, be necessary that a man must run a few steps from an oncoming blast or to block a car, turn the air and water off and on, as quite frequently one mis-step may mean an accident. Therefore, let's keep our quarries so clean that a man can walk or run anywhere at anytime without danger of falling."

Prevention of Electrical Accidents

W. M. Powell, safety director, Medusa Portland Cement Co., Cleveland, Ohio (formerly the Sandusky Cement Co.), spoke as follows:

"This will not be a technical discussion on electrical hazards but rather a discussion of electrical accidents. I do not think electrical hazards are any greater than mechanical hazards. The average person has a wholesome respect for electricity and electrical equipment and will keep away from it. The majority of those whose work is the handling of electricity or operating electrical machinery also respect it and handle it carefully.

"I have in mind a plant where the safeguarding of machinery was really neglected yet there were not many accidents because the hazards were so apparent, but when safety devices and guards were installed men grew careless and the accidents increased.

"Improper selection of men by the employment department has caused many electrical accidents, also the lack of instruction even to the right type of men. The serious-minded, non-excitable man (or youngster in the case of apprentice), is to be preferred to the opposite type which is prone to experiment, when the boss is not around, and lose their heads in a critical moment. Full and complete instructions should be given the new men as to how the job for which he has been hired should be handled, and due emphasis laid on the results of failure to work as instructed.

"Much good missionary work can be done by the close co-operation of employment and safety departments when hiring men. At one plant where I was in charge of both departments I used to take the new man and seat him across the table from me and give him a heart-to-heart talk for about five minutes, explaining the company's attitude on safety and telling him just what we expected of him in that line; the results obtained were very satisfactory. He was then sent by messenger to his foreman who went over the safety features of his job in detail with him before putting him to work. The first impressions a man gets in a new job are the deep and lasting ones and a safety thought driven home at the start is not soon forgotten.

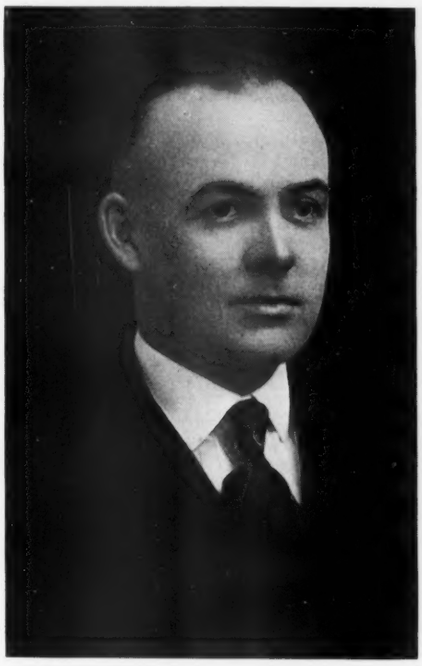
"As an additional safeguard all men should be examined physically and any men found to have a weak heart should not be placed in a position where he is likely to come in contact with electrical equipment.

Typical Electrical Accidents

"The following are typical electrical accidents, all of them preventable:

"No. 1.—Three men were dragging a car pulling cable off of a drum directly connected with a 440-hp. motor, when the cable became grounded and all three men were knocked down, one, the middle man, being killed. The motor has been changed and the leads on the new motor were on the opposite side, necessitating longer leads around the motor. These leads were not inclosed in conduit and constant rubbing against one of the anchor bolts wore off the insulation. The motor was set on a concrete base which was not sufficient ground. There is no doubt but that a physical examination of the victim at the time of employment would have disclosed a weak heart. He was perspiring freely when the accident occurred.

"No. 2.—This man was discovered on the floor near a clutch lever of a similar car puller. Help was summoned and the electrician responded at once. At this



William M. Powell

time the man sat up and on being questioned stated that he had received a shock and then got up and taking hold of the lever said "Here is where I got it." Anyone knows that a man who has just been burned is not going to put his hand back in the fire again so the electrician, becoming suspicious, accused this man of covering up, and said that he had had a fit; and the man admitted this to be true, saying that he was afraid of losing his job if it were found out. This was not an electrical accident but would probably have been passed off as one if the electrician had not been on the job.

"No. 3.—An arc welder was working outside of the boiler house with a welding outfit temporarily hooked to a 100-amp. switch on a panel inside the boiler house. The welder asked the boiler tender to pull the switch at 3:30 p. m. and it is supposed that the welder wanted to use this means of telling the time of day so that he could go to another part of the plant where he was due at that time. The tender, waiting until 3:40, pulled the switch. The welder, waiting patiently for the alarm to go off, kept on working and at 3:40 it went off with a bang and shot the entire panel, burning the tender's hand. The chances are that the welder was pulling the heaviest short circuit load possible for the capacity of the welding machine, which was beyond the capacity of the switch to rupture, causing the flash over which destroyed the panel. The welder, if he knew his business, should have known what the result would be and the tender said he thought the welder meant he would be through at 3:30 and to pull the switch to save him a trip into the boiler room. The tender was ignorant of the possible result of his act and was outside the scope of his duties. A clear case of lack of understanding and lack of instructions also.

"No. 4.—This occurred in a crane cab. The operator finding that the cables on the bucket were not being tensioned properly decided to make the necessary adjustments on the brake of the 50-hp. motor.

"The operator's story is as follows: After stopping the motor, using the controller, he opened the disconnect switch, went up on the trolley, made the adjustment and returned to the bag. Here the details are somewhat hazy, probably forgotten in the excitement following. He closed the disconnect switch with his left hand and instantly it exploded. The cover door blew open due to gases formed. He jumped back against the cab wall and a second explosion occurred. Both hands and side of face were burned. The electrician was called and found the controller handle full on. The damaged box was removed, the lines tested and found clear, whereupon a new box was installed and the crane operated as usual.

"Here is an expert's theory as to the cause: The operator on returning to the cab took hold of the disconnect switch with his left hand and the controller with his right, intending no doubt to put the switch in before opening the controller, but did not time his operations exactly and threw the controller open first and then the switch. When the flash came he put the controller on full when he jumped back against the wall of the cab and striking heavily against the wall, the vibrations caused the switch blades to form contact with the burned jaws again which caused a second flash.

"The switch box was a standard make and was strictly in accordance with the underwriters rules for the service intended. The equipment was the safest obtainable but was not proof against faulty operation.

"No. 5.—This accident occurred on a low voltage circuit. A welder and his helper were welding a patch on a large tank and were using an office electric fan for ventilating purposes, instead of an air

hose as is generally done. When the job was completed the welder told his helper to clean up. It had been raining and the helper was soaked through, even to the canvas gloves on his hands. As he unscrewed the fan plug from the socket he received a shock and could not let go, but shouted for someone to shut off the current, which was done in a few seconds. As this was being done the man's left hand was seen to move to his body under his heart and he leaned over against a column. When the current was shut off he fell to the floor dead and all efforts to revive him proved fruitless. Slight burns showed on the finger tips of his left hand and on his body where his hand was pressed and also where he leaned against the column. The line was tested and the power measured and found to be under 100 volts.

"In all of these accidents someone failed to do his full duty. True enough, the victim may have been responsible to a great extent, but until we all, especially the foremen, awaken to a realization of our responsibility for all accidents, and I mention foremen particularly because they are the king pins in this whole safety idea, these accidents will continue. I recently asked one foreman how he accounted for his good record, and by the way he is on one of our plants which will, on April 5 have gone one year without a lost-time accident. He said: 'I take the new man the first day and drill general safety ideas into him and when I have a job to be done I go over it with the men and explain to them how to do it the safest and best way. I suppose some of them think I think they don't know anything, but if the same kind of a job is to be done the next day they get their safety instructions just the same and I don't have any accidents.' That man has the right idea and the rest of the men in that plant have that same spirit. That's why they have not had a lost time accident for one year. My hat off to our Toledo plant.

"Accident records should be watched for repeaters, and they should be transferred to jobs where they are less likely to be injured or should be discharged if they cannot or will not work safely.

"The following preventive measures are suggested:

"Have all starting switches and controllers properly marked indicating just what they control.

"Properly insulated platforms at starting boxes.

"Provision for locking switches or starters when working on lines or machinery.

"Provide sufficient room behind switchboards for repair work and enclose the rear of high voltage boards, keeping the gate locked.

"Guard or elevate all exposed parts.

"Operation and repair work to be done by competent, authorized workmen.

"Require at least two men to work on repairs where exposed to electrical hazards.

"Put no dependence on insulated weatherproof covering of electric lines.

"Enclose all outside transformers and keep gate locked and posted with warning signs.

"In closing let me repeat to the foremen — you must believe in safety with your whole heart and soul before you can pass it on to your men. Let your words and actions prove to your men that you are sincere and that you are in this accident prevention business from a humane standpoint and your accident problem will be solved."

Registration, Regional Portland Cement Association Safety Meeting

International Cement Corp., New York, N. Y.
Wm. Moeller, general superintendent.

Lehigh Portland Cement Co., Fordwick, Va., and Union Bridge, Md.
Talbot Alexander.
C. E. Echelberger.
H. C. Eiler.
G. S. Heintzleman.
H. A. Johnson, superintendent, Fordwick.
F. O. Kyle.
G. S. La Forge, superintendent, Union Bridge.
W. T. Law.
W. L. Palmer.
P. M. Punkart.
Henry A. Reninger, special representative.
F. H. Sibert.
M. B. Wilson.

Lone Star Cement Co., Pennsylvania, Nazareth, Penn.
H. H. Leh, superintendent.

Lone Star Cement Co., New York, Hudson, N. Y.
C. S. Andres, superintendent.

Lone Star Cement Co., Virginia, Norfolk, Va.
P. Crome.
A. L. Crowe.
O. H. Enax.
P. J. Glennon.
G. F. Martinez, superintendent.
Dwight Morgan, vice-president.
Harry Whitney.
H. A. Williams.
E. N. Woodward.
Wallace Yerby.

Medusa Portland Cement Co., York, Penn.
Ralph Ashton.
R. J. Landis, superintendent.
W. M. Powell, safety director.
Chas. W. Powers.
E. E. Whitlatch.

North American Cement Corp., Hagerstown, Md., and Martinsburg, W. Va.
H. B. Boyer.
A. J. Collins.
A. R. Couchman, safety director.
Aaron B. Delanney.
Edwin S. Guth, district manager.
H. H. Keezer.
J. I. Leiter.
T. McAllister.
C. E. Nizewainer.
T. E. Riggs.
C. E. Taylor.
Henry W. Wetzel.
H. T. Whithington.
Russell Willard.
I. H. Zaiser.
R. C. Zeigler.

Portland Cement Association
A. J. R. Curtis.
C. S. Kimball.

Bureau of Mines
D. Harrington, chief engineer.

U. S. Casualty Co.
O. J. Smith, chief rating engineer.
C. J. Pruitt.
J. L. Underwood, Jr.

E. I. du Pont de Nemours and Co., Wilmington, Del.
Arthur La Motte, manager, Technical Section.
John Hopkins Hall, Jr., labor commissioner, Virginia.
H. W. Furlow, assistant labor commissioner, Virginia.

New Silica Consolidation

THE INDUSTRIAL SILICA CORP. was incorporated April 3 at Columbus, Ohio, for the sum of $2,750,000. The corporation will be eventually composed of nearly all the large silica sand producers in Ohio and Pennsylvania.

It is expected that the new company will be one of the largest producers of silica sand in this country, if not in the world, and will maintain offices in the principal cities. The main office will be located in Youngstown, Ohio, and the first branch will be located in Franklin, Penn.

At the present writing but three producers are actually in the consolidation. The officers of the new company are as follows: R. J. Raney, Chicago, Ill., chairman of the board; Andrew M. Scott, Chicago, Ill., vice-chairman of the board; E. E. Klooz, Youngstown, Ohio, president; J. S. Coxey, Jr., Massillon, Ohio, vice-president; Lee R. Farrell, Youngstown, secretary-treasurer.

Cumberland Cement Company Management Changed

ROCK PRODUCTS is officially informed that the controlling interest in the Cumberland Portland Cement Co., Cowan, Tenn., has changed hands, and the new officers of the company are as follows: M. C. Monday, president and general manager; E. L. Hampton, vice-president; R. T. Miller, vice-president; A. N. Trice, secretary and treasurer.

Mr. Monday is also president of the Hermitage Portland Cement Co., Nashville, Tenn. Mr. Miller has been the general manager of the Cumberland company since its beginning. Messrs. Hampton and Trice are apparently newcomers in the cement industry.

Pennsylvania-Dixie Has Not Abandoned Kingsport Plant

ROCK PRODUCTS is informed by Blaine S. Smith, president of the Pennsylvania-Dixie Cement Corp., that the news item in the issue of March 2, quoting a Macon, Ga., newspaper to the effect that the Clinchfield, Ga., plant of the company was to have an increased output, and inferring that the Kingsport, Tenn., plant had been more or less permanently shut down, is inaccurate. Mr. Smith states:

"We do not contemplate any increase in capacity of our Clinchfield plant at this time. Our Kingsport, Tenn., plant is temporarily closed down largely because of the competition of cheap foreign cement from Belgium. We are making a complete study of conditions at the Kingsport plant and we hope to take advantage of this shutdown period in order to make such changes as we find desirable and practicable. The impression has been given by someone in certain quarters that our Kingsport plant is being abandoned. This is, of course, entirely incorrect."

Fort Dodge, Iowa, Gypsum Manufacturer Asks Tariff Protection

UTTER RUIN faces domestic gypsum producers unless Congress enacts a tariff of at least $3.00 per ton on importations of crude gypsum, says T. F. Breen, general manager of the Cardiff Gypsum Plaster Co., Fort Dodge, Iowa, in a letter to the ways and means committee of the United States House of Representatives.

All of the domestic producers, except those who are also importing rock, are a unit in favor of this tariff, according to Mr. Breen.

Mr. Breen criticizes representatives of the Atlantic and Pacific seaboards, who, he says, "want a high protective tariff on the things which they produce to sell to the interior and free trade on the things produced in the interior."

And Mr. Breen goes on to say: "If our representatives from the interior are foolish enough to let them get away with this program, business conditions in the interior will be hopeless, and, of course, if the purchasing power of the interior is destroyed through adverse legislation, it finally will be reflected in poor business conditions in the seaboard sections."

Mr. Breen's Letter

Following is Mr. Breen's letter complete:

Ways and Means Committee,
House of Representatives,
Washington, D. C.

Dear Sirs:

I notice from the records of a recent hearing that importers of gypsum are claiming that the domestic producers are not a unit in asking for a protective tariff on importations of crude gypsum. This is not true. All of the domestic producers except those who are also importing rock are a unit in hoping that congress will save the domestic producers from utter ruin by the enactment of a tariff law providing a duty of at least $3.00 per ton on importations of crude gypsum. This would about equalize the difference between water and railroad freight rates and would prevent the chief importer from maintaining a less-than-cost price at his mills in the interior while he is living off the profits on gypsum imported from Nova Scotia.

The committee for which I spoke at the hearing before your committee on the tenth of January represented nearly all of the domestic producers, but in addition to this there is another organization headed by Dr. Ellerbeck, of Utah, representing the far western interior producers, who are working to the same end with the finance committee of the Senate.

Three of the domestic producers have taken no part but two of these urged me to attend the hearing on January 10, explaining that they could not take an active part because of some contracts which they had with the chief importer, fearing that if they did so the chief importer would cancel these contracts and make it even more difficult for them to survive the present price war. The third producer, I am reliably informed, took no active part for the same reason.

Congress should not be concerned with the companies or groups producing gypsum, but congress should be vastly concerned as to whether the gypsum requirements of the United States are supplied from domestic deposits rather than foreign deposits because this involves the employment of American labor, business for American railroads, and the general prosperity of this country. American railroads get no haul and American railway workmen are not employed when gypsum is brought into this country in vessels sailing under the British flag.

Nor is this all. The whole tariff system was built upon the theory that it would furnish a home market to American farmers and this would be the American farmers' compensation for using American manufactured goods sold at a high price in the American market under the shelter of the protective tariff. If American miners and railroad men are not given employment and if American raw material is not utilized, the American farmer will be excluded from the benefits of a home market to just that extent.

It is high time that our representatives from the interior learned to vote in the interests of the sections which they are serving just as residents of Atlantic and Pacific seaboards vote for what they conceive to be the selfish interests of their sections. Of course, it is stupid for anyone to think that he can long maintain the prosperity of any section of this country by destroying the purchasing power of the interior.

Congress has recently appropriated $300,000,000 to help the ship-building industries of the seaboards. Senator Hiram Johnson of California pulled down an appropriation of $165,000,000 to irrigate land in California. Millions were expended in the construction of the Panama canal, which enables the Atlantic seaboard to send freight from the Atlantic to the Pacific at one-third the cost from Chicago to the Pacific.

Notwithstanding all these legislative advantages, residents of the Atlantic and Pacific seaboards now want a high protective tariff on the things which they produce to sell to the interior and free trade on the things produced in the interior.

If our representatives from the interior are foolish enough to let them get away with this program, business conditions in the interior will be hopeless, and, of course, if the purchasing power of the interior is destroyed through adverse legislation, it finally will be reflected in poor business conditions in the seaboard sections. America is the best market in the world for American manufacturers, and tariff laws should not be framed to destroy American inland industries.

Yours very truly,
T. F. BREEN.

—*Fort Dodge* (Iowa) *Messenger.*

Lehigh Cement to Double Capacity of Sandt's Eddy Plant

THE ANNUAL REPORT of Col. E. M. Young, president of the Lehigh Portland Cement Co., Allentown, Penn., to stockholders of the company, dated January 2, 1929, announced that: "As a part of the 1929 construction program the capacity of the Sandt's Eddy plant, near Easton, Penn., will be doubled, thereby increasing the productive capacity from 1,000,000 to 2,000,000 bbl. per year."

For Tariff on Sand and Gravel

FOR THE FIRST TIME in the history of tariff legislation, the sand and gravel industry is represented in the appeals for protection against imported materials. While the original complaints came from domestic producers who were competing with water-borne materials entering Cleveland and Detroit from Canadian operations, investigation developed that the effects of these water-borne materials were being felt at almost every city in the Great Lakes basin area. It was also contended by domestic producers shipping into Seattle that Canadian producers were dumping materials on American markets at prices substantially lower than they were charging in their home markets—with the consequence that domestic market conditions had become completely demoralized.

A duty of 5 cents per 100 lb. on sand and gravel imported from other countries has been requested. A similar duty is now imposed under existing tariff law on crushed limestone, a competing material. A formal petition, embracing all the facts and furnishing data with respect to the growing trend of imported sand and gravel (it has increased 600% since 1922) was presented to the Ways and Means Committee in behalf of domestic producers, it being emphasized that if this rate of increase were maintained in the future, American producers would be forced completely to abandon markets upon which they now depend for a considerable portion of their business.—*National Sand and Gravel Bulletin.*

Building Lime-Pulverizing Plant

AMONG the industrial developments in progress is the expansion of the Blue Grass Lime Co. plant at Maxwell, Va., of which Fields Graybeal is owner and operator. These kilns have been in operation for several years, having a daily capacity of about 50 tons of burned lime. Owing to the prevalence of agricultural lime sowers and distributing attachments for grain drills, the market demands that this form of fertilizer be pulverized. Therefore, the installation of machinery for the purpose has become necessary in order to fill the demand.

Mr. Graybeal formed an association with the Planters Lime and Chemical Co. of Norfolk several years ago and has sold a great deal of his output to that firm, which has applied the grinding process necessary to its preparation for agricultural use.

He now finds that by installing an electric generator at the dam, where the flour mill is located, that sufficient power can be developed to operate the machines at the lime plant and that he can serve territory not reached by the Norfolk concern, and thereby be in continuous operation. A large warehouse to provide storage space during the off season is nearing completion.

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended Mar. 9	Limestone Flux Week ended Mar. 16	Sand, Stone and Gravel Week ended Mar. 9	Sand, Stone and Gravel Week ended Mar. 16
Eastern	2,426	2,395	2,018	2,384
Allegheny	2,929	3,174	2,313	3,335
Pocahontas	174	201	342	405
Southern	402	425	6,223	6,225
Northwestern	541	593	1,541	1,789
Central Western	633	587	5,745	6,165
Southwestern	403	410	5,599	5,434
Total	7,508	7,785	23,781	25,737

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1928 AND 1929

District	Limestone Flux 1928 Period to date Mar. 17	Limestone Flux 1929 Period to date Mar. 16	Sand, Stone and Gravel 1928 Period to date Mar. 17	Sand, Stone and Gravel 1929 Period to date Mar. 16
Eastern	20,075	24,202	20,592	19,043
Allegheny	30,169	30,030	24,692	23,103
Pocahontas	2,350	1,462	5,239	3,479
Southern	5,534	4,624	92,809	69,163
Northwestern	6,882	5,871	17,858	9,898
Central Western	4,363	5,192	58,585	54,846
Southwestern	4,446	4,166	45,971	48,715
Total	73,819	75,547	265,746	228,247

COMPARATIVE TOTAL LOADINGS, 1928 AND 1929

	1928	1929
Limestone flux	*73,819*	*75,547*
Sand, stone, gravel	*265,746*	*228,247*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning April 6:

CENTRAL FREIGHT ASSOCIATION DOCKET

20996. To establish on **stone, crushed,** in bulk only; **crushed stone screenings,** in bulk only; **limestone, agricultural** (not ground or pulverized), in bulk in open top cars only; **stone tailings,** carloads, from Silica, Findlay, Holland, Maple Grove, Marblehead, Woodville, Gibsonburg and Ransoms, O., to various points in Michigan, commodity rates on basis of the P. S. M. 923 Scale or the Michigan Multiple Scale, whichever is higher, as minimum, and on basis of actual mileage via percentage routes. Proposed rates from Maple Grove, Woodville, Gibsonburg, Ransoms and Findlay, O., are also predicated on observing rates from Marblehead, O., as a minimum. A statement of representative present and proposed rates is attached hereto as Exhibit A.

Fourth Section—Rule 77 at destination and origin points.

EXHIBIT A
Illustrations
Grand Trunk Railway System

From—Silica, O.
T. A. & W. R. R.

To	Miles	Route	Rate Pres.	Rate Prop.
G. T. W.—Main L.				
Potterville, Mich.	148.4	4	.....	130
Imlay City, Mich.	145.9	6	.....	130
P. D. & N. R. R.				
Clifford, Mich.	167.3	6	.....	135

From—Holland, O.
N. Y. C. R. R.

To	Miles	Route	Rate Pres.	Rate Prop.
G. T. W.—Main L.				
Imlay City, Mich.	156	D	.....	135
P. D. & N. R. R.				
Clifford, Mich.	148	DP	.....	125

From—Findlay, O.
N. Y. C. R. R. (O. C. L.)

To	Miles	Route	Rate Pres.	Rate Prop.
G. T. W.—Main L.				
Potterville, Mich.	235	D	.....	165
Imlay City, Mich.	212	D	.....	155
P. D. & N. R. R.				
Clifford, Mich.	204	TDP	.....	155

Note 1—Minimum weight marked capacity of car.
Note 2—Minimum weight 90% of marked capacity of car.
Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

From—Ransoms, O.
C. C. C. & St. L. Ry.

To	Miles	Route	Rate Pres.	Rate Prop.
G. T. W.—Main L.				
Potterville, Mich.	222	A	*	155
Imlay City, Mich.	226	A	*	165
D. G. H. & M. Div.				
Burton, Mich.	194	A	*	145
T. S. & M. Div.				
Ola, Mich.	214	A	*	155
Moorland, Mich.	291	A	*	185
M. A. L. Div.				
Amy, Mich.	181	C	*	145
C. S. & M. Div.				
Fosters, Mich.	207	A	*	155
P. D. & N. R. R.				
Clifford, Mich.	241	CA	*	165

*Class rate.

From—Maple Grove, O.
P. R. R.

To	Miles	Route	Rate Pres.	Rate Prop.
G. T. W.—Main L.				
Potterville, Mich.	175	(3)	.....	145
Imlay City, Mich.	151	(4)	.....	145
D. H. G. & M. Div.				
Burton, Mich.	146	(5)	.....	145
T. S. & M. Div.				
Ola, Mich.	168	(6)	.....	155
Moorland, Mich.	245	(6)	.....	185
M. A. L. Div.				
Amy, Mich.	120	(1)	.....	130
C. S. & M. Div.				
Fosters, Mich.	160	(3)	.....	155
P. D. & N. R. R.				
Clifford, Mich.	172	(4)	.....	145

From—Marblehead, O.
L. S. & M. R. R.

To	Miles	Route	Rate Pres.	Rate Prop.
G. T. W.—Main L.				
Potterville, Mich.	191	L	.....	145
Imlay City, Mich.	195	DL	.....	145
D. H. G. & M. Div.				
Burton, Mich.	190	DL	.....	145
T. S. & M. Div.				
Ola, Mich.	210	DL	.....	155
Moorland, Mich.	287	DL	.....	185
M. A. L. Div.				
Amy, Mich.	135	DL	.....	130
C. S. & M. Div.				
Fosters, Mich.	203	DL	.....	155
P. D. & N. R. R.				
Clifford, Mich.	187	LDP	.....	145

From—Gibsonburg, Ohio.

To	Miles	Route	Rate Pres.	Rate Prop.
Pottersville, Mich.	162	(3)	.....	145
Imlay City, Mich.	138	(4)	.....	145
D. G. H. & M. Div.				
Burton, Mich.	133	(5)	.....	145
T. S. & M. Div.				
Ola, Mich.	155	(6)	.....	155
Moorland, Mich.	232	(6)	.....	185
M. A. L. Div.				
Amy, Mich.	107	(1)	.....	130
C. S. & M. Div.				
Fosters, Mich.	147	(3)	.....	155
P. D. & N. R. R.				
Clifford, Mich.	159	(4)	.....	145

From—Woodville, Ohio.

To	Miles	Route	Rate Pres.	Rate Prop.
G. T. W.—Main L.				
Potterville, Mich.	157	(3)	.....	145
Imlay City, Mich.	133	(4)	.....	145
D. G. H. & M. Div.				
Burton, Mich.	128	(5)	.....	145
T. S. & M. Div.				
Ola, Mich.	150	(6)	.....	155
Moorland, Mich.	227	(6)	.....	185
M. A. L. Div.				
Amy, Mich.	102	(1)	.....	130
C. S. & M. Div.				
Fosters, Mich.	142	(3)	.....	155
P. D. & N. R. R.				
Clifford, Mich.	154	(4)	.....	145

Route No.
4—T. A. & W., Toledo, Ohio, A. A. R. R., Durand, Mich., and G. T. Ry. Sys.
6—T. A. & W., Toledo, Ohio, D. & T. S. L. R. R., Detroit, Mich., G. T. Ry. Sys., Pontiac, Mich., and P. O. & N. R. R.
(1)—Penna. R. R., Detroit, Mich., and G. T. Ry. Sys.
(3)—Penna. R. R., Toledo, Ohio, A. A. R. R., Durand, Mich., and G. T. Ry. Sys.
(4)—Penna. R. R., Detroit, Mich., G. T. Ry. Sys., Pontiac, Mich., and P. O. & N. R. R.
(5)—Penna. R. R., Toledo, Ohio, A. A. R. R., Owosso, Mich., and G. T. Ry. Sys.
(6)—Penna. R. R., Toledo, Ohio, A. A. R. R., Ashley, Mich., and G. T. Ry. Sys.
A—C. C. C. & St. L. Ry., Toledo, Ohio, A. A. R. R., Durand, Mich., and G. T. Ry. Sys.
C—C. C. C. & St. L. Ry., Toledo, Ohio, A. A. R. R., Lakeland, Mich., and G. T. Ry. Sys.
CA—C. C. C. & St. L. Ry., Toledo, Ohio, D. & T. S. L. R. R., Detroit, Mich., G. T. Ry. Sys., and Pontiac, Mich.
DL—L. S. & M., Danbury, Ohio, N. Y. C. R. R., Detroit, Mich., and G. T.
L—L. S. & M., Danbury, Ohio, N. Y. C. R. R., Lansing, Mich., and G. T.
D—N. Y. C., Detroit, Mich., G. T. R. R.
LDP—L. S. & M., Danbury, Ohio, N. Y. C. R. R., Detroit, Mich., G. T. R. R., Pontiac, Mich., P. O. & N.

CRUSHED STONE
Ohio Points to Michigan Ann Arbor Stations

From—Silica, Ohio.
T. A. & W.

To	Miles	Route	Rate Pres.	Rate Prop.
Ann Arbor, Mich.	54	A1	115	92
Shepherd, Mich.	166	A1	.....	135

From—Holland, Ohio.
N. Y. C. R. R.

To	Miles	Route	Rate Pres.	Rate Prop.
Ann Arbor, Mich.	55	A2	.....	92
Shepherd, Mich.	166	A2	.....	135

From—Findlay, Ohio
N. Y. C. R. R.

To	Miles	Route	Rate Pres.	Rate Prop.
Ann Arbor, Mich.	90	A2	.....	115
Shepherd, Mich.	201	A2	.....	155

From—Ransoms, Ohio.
C. C. C. & St. L. Ry.

To	Miles	Route	Rate Pres.	Rate Prop.
Ann Arbor, Mich.	92	A3	.....	115
Shepherd, Mich.	203	A3	.....	155

From—Maple Grove, Ohio.
P. R. R.

To	Miles	Route	Rate Pres.	Rate Prop.
Ann Arbor, Mich.	80	A4	115	115
Shepherd, Mich.	191	A4	.....	155

From—Maple Grove, Ohio.
N. Y. C. & St. L. R. R.

To	Miles	Route	Rate Pres.	Rate Prop.
Ann Arbor, Mich.	92	A5	.....	115
Shepherd, Mich.	203	A5	.....	155

From—Marblehead, Ohio.
L. S. & M. R. R.

To	Miles	Route	Rate Pres.	Rate Prop.
Ann Arbor, Mich.	93	A6	.....	115
Shepherd, Mich.	204	A6	.....	155

Route No.
A1—T. A. & W., Toledo, Ohio, A. A.
A2—N. Y. C.
A3—C. C. C. & St. L., Clyde, Ohio, N. Y. C. R. R., Toledo, Ohio, A. A.
A4—P. R. R., Toledo, Ohio, A. A.
A5—N. Y. C. & St. L., Fostoria, Ohio., N. Y. C. or H. V., Toledo, Ohio, A. A.
A6—L. S. & M., Danbury, Ohio, N. Y. C., Toledo, Ohio, A. A.

CRUSHED STONE AND CRUSHED STONE SCREENINGS

Michigan Central R. R.

From—Silica, Ohio.
T. A. & W.

To	Miles	Route	Rate Pres.	Rate Prop.
Jackson, Mich.	134	A	.....	125
Niles, Mich.	250	A	*145	165

From—Maple Grove, Ohio.
P. R. R.

To	Miles	Route	Rate Pres.	Rate Prop.
Jackson, Mich.	118	I	.....	130
Niles, Mich.	234	I	219	165

From—Maple Grove, Ohio.
N. K. P.

To	Miles	Route	Rate Pres.	Rate Prop.
Jackson, Mich.	170	K	.....	.....
Niles, Mich.	287	K	.....	.....

From—Marblehead, Ohio.
Lakeside & Marblehead R. R.

To	Miles	Route	Rate Pres.	Rate Prop.
Jackson, Mich.	170	B	.....	.....
Niles, Mich.	224	C	155	155

From—Holland, Ohio
Michigan Central R. R.

To—	Miles	Route	Pro. Rate
Jackson, Mich.	.....	....	.....
Niles, Mich.	197	G	145

From—Findlay, Ohio
N. Y. C. (44.5), Toledo

To—	Miles	Route	Pro. Rate
Jackson, Mich.	170	F	135
Niles, Mich.	286	F	185

From—Ransoms, Ohio
C. C.C. & St. L.(81.2), Tol. direct

To—	Miles	Route	Pro. Rate
Jackson, Mich.	165	J	135
Niles, Mich.	282	J	185

From—Gibsonburg, Ohio
P. R. R. (21.4), Toledo

To—	Miles	Route	Pro. Rate
Jackson, Mich.	105	I	130
Niles, Mich.	222	I	155

From—Woodville, Ohio
P. R. R.(16.3), Toledo

To—	Miles	Route	Pro. Rate
Jackson, Mich.	100	I	130
Niles, Mich.	217	I	135

Route No.
A—T. A. & W. (8.3), Toledo, Ohio, and M. C. R. R.
B—L. & M. Ry. (8.0), Danbury, Ohio, N. Y. C. (39.5), Toledo, Ohio, and M. C. R. R.
C—L. & M. Ry. (8.0), Danbury, Ohio, N. Y. C. (110.2), Jackson, Mich., and M. C. R. R.
F—N. Y. C., Toledo, Ohio, and M. C. R. R. (N. Y. C., 8.9, from Holland), (N. Y. C., 44.5, Findlay).
G—N. Y. C. (79.6), Jackson, Mich., and M. C. R. R.
I—P. R. R., Toledo, Ohio, A. A. R. R. (45.a), Ann Arbor, Mich., and M. C. R. R.
J—C. C. C. & St. L. (81.2), Toledo, Ohio, A. A. R. R. (45.2), Ann Arbor, Mich., and M. C. R. R.
K—N. Y. C. & St. L., Fostoria, H. V., Toledo, M. C. Will not apply via Jackson, Mich.

CRUSHED STONE, CRUSHED STONE SCREENINGS AND AGRICULTURAL LIMESTONE

Ohio Points to Michigan
N. Y. C. R. R.

From—Silica, Ohio
T. A. & W. R. R.

To	Miles	Route	Rate Pres.	Rate Prop.
Jackson, Mich.	79	N-1	105	102
Dore, Mich.	221	N-1	184	155

From—Holland, Ohio
N. Y. C. R. R.

To	Miles	Route	Rate Pres.	Rate Prop.
Jackson, Mich.	80	N-2	105	100
Dore, Mich.	222	N-2	184	155

From—Findlay, Ohio
N. Y. C. R. R. (O. C. L.)

To	Miles	Route	Rate Pres.	Rate Prop.
Jackson, Mich.	116	N-3	Cls.	117
Dore, Mich.	258	N-3	Cls.	175

From—Ransoms, Ohio
C. C. C. & St. L.

To	Miles	Route	Rate Pres.	Rate Prop.
Jackson, Mich.	119	N-4	Cls.	117
Dore, Mich.	261	N-4	Cls.	175

From—Maple Grove, Ohio
P. R. R.

To	Miles	Route	Rate Pres.	Rate Prop.
Jackson, Mich.	105	N-5	Cls.	117
Dore, Mich.	247	N-5	Cls.	175

From—Maple Grove, Ohio
N. Y. C. & St. L.

To	Miles	Route	Rate Pres.	Rate Prop.
Jackson, Mich.	137	N-7	Cls.	.....
Dore, Mich.	279	N-7	Cls.	.....

From—Marblehead, Ohio
L. S. & M.

To	Miles	Route	Rate Pres.	Rate Prop.
Jackson, Mich.	118	N-6	117	117
Dore, Mich.	260	N-6	.....	175

Route No.
N-1—T. A. & W., Miller, Jct. O., and N. Y. C.
N-2—N. Y. C.
N-3—N. Y. C. (O. C. L.), Toledo, O., and N. Y. C. (W.).
N-4—C. C. C. & St. L., Clyde, O., and N. Y. C. (W.).
N-5—P. R. R., Toledo, O., and N. Y. C. (W.).
N-6—L. S. & M., Danbury, O., and N. Y. C. (W.).
N-7—N. Y. C. & St. L., Bellevue, N. Y. C.

Pere Marquette Stations

From—Gibsonburg, Ohio
(21.4 min. to Tol.)

To	Miles	Route	Rate Pres.	Rate Prop.
Clio, Mich.	139.2	A-1	.....	135
Lakeview, Mich. 7	224.2	A-1	.....	175
Coral, Mich.	213.4	A-1	.....	165
Meridian, Mich.	131.6	A-1	.....	135
Zerland, Mich.	226.8	A-1	.....	175
Bailey, Mich.	231.8	A-1	.....	175
Allegan, Mich.	.....	.....	.....	.....
Bad Axe, Mich.	225	A-1	196	175
Croswell, Mich.	268.5	A-1	.....	185
Port Huron, Mich.	.....	A-1	207	.....

From—Woodville, Ohio
(16.3 min. to Tol.)

To	Miles	Route	Rate Pres.	Rate Prop.
Clio, Mich.	134.1	A-1	.....	135
Lakeview, Mich.	219.1	A-1	.....	175
Coral, Mich.	208.3	A-1	.....	165
Meridian, Mich.	126.5	A-1	.....	135
Zerland, Mich.	221.7	A-1	.....	175
Bailey, Mich.	226.7	A-1	.....	175
Allegan, Mich.	.....	.....	.....	.....
Bad Axe, Mich.	219.9	A-1	196	175
Croswell, Mich.	263.4	A-1	.....	185
Port Huron, Mich.	.....	A-1	207	.....

From—Marblehead, Ohio
(48 min. Toledo)

To	Miles	Route	Rate Pres.	Rate Prop.
Clio, Mich.	165.8	A-2	.....	135
Lakeview, Mich.	251	A-2	.....	175
Coral, Mich.	240	A-2	.....	165
Meridian, Mich.	159	A-2	.....	135
Zerland, Mich.	253	A-2	.....	175
Bailey, Mich.	258	A-2	.....	175
Allegan, Mich.	.....	.....	.....	.....
Bad Axe, Mich.	252	A-2	.....	175
Croswell, Mich.	296	A-2	.....	185
Port Huron, Mich.	.....	A-2	.....	.....

From—Ransoms, Ohio
(46.8 min. to Toledo)

To	Miles	Route	Rate Pres.	Rate Prop.
Clio, Mich.	164.6	A-3	.....	135
Lakeview, Mich.	250	A-3	.....	175
Coral, Mich.	239	A-3	.....	165
Meridian, Mich.	158	A-3	.....	135
Zerland, Mich.	252	A-3	.....	175
Bailey, Mich.	257	A-3	.....	175
Allegan, Mich.	.....	.....	.....	.....
Bad Axe, Mich.	251	A-3	.....	175
Croswell, Mich.	295	A-3	.....	185
Port Huron, Mich.	.....	A-3	.....	.....

CRUSHED STONE

(Ohio to Michigan)
Pere Marquette Stations

From—Silica, Ohio

To	Miles	Route	Rate Pres.	Rate Prop.
Clio, Mich.	127	A-4	.....	125
Lakeview, Mich.	212	A-4	.....	155
Coral, Mich.	201	A-4	.....	155
Meridian, Mich.	119	A-4	.....	117
Zerland, Mich.	.....	.....	.....	.....
Bailey, Mich.	219	A-4	.....	155
Allegan, Mich.	.....	.....	.....	.....
Bad Axe, Mich.	.....	.....	.....	.....
Croswell, Mich.	.....	.....	.....	.....
Port Huron, Mich.	.....	.....	.....	.....

From—Holland, Ohio

Pere Marquette Stations

To	Miles	Route	Prop. Rate
Clio, Mich.	127	A-5	125
Lakeview, Mich.	212	A-5	155
Coral, Mich.	201	A-5	.....
Meridian, Mich.	120	A-5	117
Zerland, Mich.	.....	.....	.....
Bailey, Mich.	220	A-5	155
Allegan, Mich.	.....	.....	.....
Bad Axe, Mich.	.....	.....	.....
Croswell, Mich.	.....	.....	.....
Port Huron, Mich.	.....	.....	.....

From—Findlay, Ohio

To	Miles	Route	Prop. Rate
Clio, Mich.	164	A-5	135
Lakeview, Mich.	248	A-5	175
Coral, Mich.	237	A-5	165
Meridian, Mich.	156	A-5	135
Zerland, Mich.	.....	.....	.....
Bailey, Mich.	255	A-5	175
Allegan, Mich.	.....	.....	.....
Bad Axe, Mich.	.....	.....	.....
Croswell, Mich.	.....	.....	.....
Port Huron, Mich.	.....	.....	.....

From—Maple Grove, Ohio
P. R. R.

To	Miles	Route	Prop. Rate
Clio, Mich.	152	A-1	135
Lakeview, Mich.	237	A-1	175
Coral, Mich.	226	A-1	165
Meridian, Mich.	145	A-1	135
Zerland, Mich.	240	A-1	175
Bailey, Mich.	241	A-1	175
Allegan, Mich.	.....	.....	.....
Bad Axe, Mich.	238	A-1	*175
Croswell, Mich.	282	A-1	185
Port Huron, Mich.	2	A-1	207

*Present rate, 196.

From—Maple Grove, Ohio
N. Y. C. & St. L.

To	Miles	Route	Rate Pres.	Rate Prop.
Clio, Mich.	163	A-6	135	140
Lakeview, Mich.	242	A-6	165	165
Coral, Mich.	238	A-6	.....	165
Meridian, Mich.	160	A-6	.....	135
Zerland, Mich.	255	A-6	.....	175
Bailey, Mich.	256	A-6	.....	175
Allegan, Mich.	.....	.....	.....	.....
Bad Axe, Mich.	249	A-6	.....	175
Croswell, Mich.	293	A-6	.....	185
Port Huron, Mich.	.....	.....	.....	.....

Route No.
A-1—Penna. R. R., Toledo, O., P. M.
A-2—L. S. & M. R. R., Danbury, O., N. Y. C. R. R., Toledo, O., P. M.

A-3—C. C. C. & St. L. Ry., Clyde, N. Y. C. R. R., Toledo, O., P. M.
A-4—T. A. & W., Toledo, O., P. M.
A-5—N. Y. C., Toledo, O., P. M.
A-6—N. Y. C. & St. L., Fostoria, O., H. V., Toledo, O., P. M.

CRUSHED STONE
(Ohio to Michigan)
P. R. R.

From—Maple Grove, Ohio
N. Y. C. & St. L.

To	Miles	Route	Rate Pres.	Rate Prop.
Martins, Mich.	.....	.....	.....	.....

From—Marblehead, Ohio

To	Miles	Route	Rate Pres.	Rate Prop.
Martins, Mich.	214	2	.....	155

From—Maple Grove, Ohio
P. R. R.

To	Miles	Route	Rate Pres.	Rate Prop.
Martins, Mich.	206	.....	.....	155

Route 2—L. S. & M., Danbury, O., N. Y. C., Sturgis, Mich., P. R. R.

Cin. Nor. R. R. Stations

From—Silica, Ohio
T. A. & W.

To	Miles	Route	Prop. Rate
Hudson, Mich.	92	A	115
C. C. C. & St. L. Points			
Niles, Mich.	205	J	155

From—Holland, Ohio
N. Y. C.

To	Miles	Route	Prop. Rate
Hudson, Mich.	115	B	102
C. C. C. & St. L. Points			
Niles, Mich.	204	I	155

From—Findlay, Ohio
N. Y. C. R. R. (O. C. L.)

To	Miles	Route	Prop. Rate
Hudson, Mich.	128	B	130
C. C. C. & St. L. Points			
Niles, Mich.	204	H	155

From—Ransoms, Ohio

To	Miles	Route	Prop. Rate
Hudson, Mich.	130	C	130
C. C. C. & St. L. Points			
Niles, Mich.	202	G	155

From—Maple Grove, Ohio
N. Y. C. & St. L.

To	Miles	Route	Prop. Rate
Hudson, Mich.	131	D	130
C. C. C. & St. L. Points			
Niles, Mich.	148	G	125

From—Marblehead, Ohio
L. S. & M.

To	Miles	Route	Prop. Rate
Hudson, Mich.	132	E	130
C. C. C. & St. L. Points			
Niles, Mich.	165	F	135

Routes
A—T. A. & W., Toledo, O., N. Y. C. R. R., Bryan, O., C. N. R. R.
B—N. Y. C., Bryan, O., C. N. R. R.
C—C. C. C. & St. L. Ry., Clyde, O., N. Y. C., Bryan, O., C. N. R. R.
D—N. Y. C. & St. L. Ry., Latty, O., C. N. R. R.
E—L. S. & M., Danbury, O., N. Y. C. R. R., Bryan, O., C. N. R. R.
F—T. A. & W., Toledo, O., N. Y. C., Elkhart, Ind., C. C. C. & St. L. Ry.
G—N. Y. C., Elkhart, Ind., C. C. C. & St. L. Ry.
H—C. C. C. & St. L. Ry., Clyde, O., N. Y. C., Elkhart, Ind., C. C. C. & St. L. Ry.
I—N. Y. C. & St. L. Ry., Claypool, Ind., C. C. C. & St. L. Ry.
J—L. S. & M., Danbury, O., N. Y. C., Elkhart, Ind., C. C. C. & St. L. Ry.

21039. To establish on **crushed stone and crushed stone screenings,** carloads, Whitehouse, O., to points in Michigan on M. C. R. R., via Wabash Ry., Toledo, O., rates as illustrated in Exhibit "D" attached:

EXHIBIT "D."

To	Miles	Scales Mich. 2 Lines	Ohio	Proposed
Center Line	85	102	100	102
Warren	89	107	100	107
Utica	95	107	105	107
Depew's Siding	99	107	105	107
Yates	100	107	105	107
Rochester	103	112	105	112
Goodison	107	112	115	112
Orion	112	112	115	115
Oxford	115	112	115	115
Thomas	119	117	115	117
Metamora	124	117	115	117
Hunters Creek	127	117	125	125
Lapeer	132	122	125	125
Carpenter	137	122	125	125
Columbianville	141	122	125	125
Otter Lake	145	122	125	125
Millington	151	127	135	135
Vassar	158	127	135	135
Reese	166	127	135	135
Mungers	173	132	135	135
Bay City	181	132	145	145
Bangor	189	132	145	145
Auburn	192	137	145	145
Fisherville	194	137	145	145
Midland	200	137	145	145
Dearborn	79	102	100	102
Eloise	84	102	100	102
Denton	94	107	105	107
Geddes	102	112	105	112
Delhi	112	112	115	115
Dexter	116	117	115	117
Chelsea	123	117	115	117
Francisco	130	117	125	125
Inkster	83	102	100	102
Grass Lake	134	122	125	125
Leoni	137	122	125	125
Leslie	160	127	135	135
Eden	165	127	135	135
Mason	169	127	135	135
Holt	175	132	135	135
Lansing	181	132	145	145
Chandler	187	132	145	145
Bath	189	132	145	145
Laingsburg	198	137	145	145
Bennington	204	137	155	155
Henderson	206	137	155	155
Oakley	206	137	155	155
Chesaning	202	137	155	155
Fergus	197	137	145	145
St. Charles	194	137	145	145
Garfield	190	132	145	145
Swan Creek	187	132	145	145
Paines	184	132	145	145
Mershon	180	132	145	145
Shields	186	132	145	145
Zilwaukee	183	132	145	145
Salzburg	183	132	145	145
Charlotte	179	132	145	145
Chester	185	132	145	145
Vermontville	191	137	145	145
Nashville	194	137	145	145
Morgan	197	137	145	145
Thorn Apple	200	137	145	145
Quimby	202	137	155	155
Hastings	208	137	155	155
Irving	214	137	155	155
Middleville	218	142	155	155

In cents per net ton

21040. To establish on **crushed stone and crushed stone screenings,** carloads, Whitehouse, O., to points in Michigan on N. Y. C. R. R., rates as shown in Exhibit "E" attached. Present and proposed rates as shown in Exhibit "E" attached:

EXHIBIT "E."

To	Miles	Scales Pres.	Mich. 2 Lines	Ohio	Pro.
Via Toledo—					
Ottawa Lake	32	....	82	75	82
Riga	37	....	82	80	82
Blissfield	40	90	82	80	82
Adrian	50	....	87	85	87
Cadmus	57	....	92	90	92
Allen	93	....	107	105	107
Quincy	100	....	107	105	107
Via Ft. Wayne—					
Batavia	195	....	137	145	145
Burr Oak	183	....	132	145	145
Bronson	189	....	132	145	145
Klingers Lake	182	....	132	145	145
Via Toledo—					
Ogden	77	....	87	85	87
Jasper	51	....	92	85	92
Weston	54	....	92	85	92
Morenci	60	....	92	90	92
Via Ft. Wayne—					
Findlay	183	....	132	145	145
Via Toledo—					
Vienna	32	....	82	75	82
Monroe	41	....	87	80	87
Newport	49	....	87	85	87
Rockwood	54	....	92	85	92
Trenton	61	....	97	90	97
Wyandotte	65	....	97	90	97
Ecorse	68	....	97	95	97
Detroit	82	....	102	100	102
Strasburg	48	....	87	85	87
Ida	51	....	92	85	92
Petersburg	58	....	92	90	92
Deerfield	55	....	92	85	92
Dundee	71	....	102	95	102
Rea	67	....	97	95	97
Britton	60	....	92	90	92
Ridgeway	59	....	92	90	92
Onsted	68	....	97	95	97
Norvell	74	....	102	95	102
Napoleon	77	....	102	100	102
Ypsilanti	92	....	107	105	107
Pittsfield Jct.	85	....	102	100	102
Saline	81	....	102	100	102
Bridgewater	75	....	102	95	102
Mosherville	94	....	107	105	107
Via Ft. Wayne—					
Bankers	142	....	122	125	125
Reading	138	....	122	125	125
Montgomery	132	....	122	125	125
Via Toledo—					
Litchfield	95	....	107	105	107
Devercreaux	117	....	117	115	117
Springport	121	....	117	115	117
Via Ft. Wayne—					
Constantine	180	....	132	145	145
Moore Park	192	....	137	145	145
Flowerfield	196	....	137	145	145
Portage	206	....	137	155	155
Otsego	288	....	142	165	165
Hopkins	245	....	147	165	165
Hilliards	249	....	147	165	165
Dorr	253	....	147	175	175
Byron Center	256	....	147	175	175

In cents per net ton

21041. To establish on **crushed stone and crushed stone screenings,** carloads, Whitehouse, O., to points in Michigan on P. M. Ry. via Wabash Ry., Toledo, O., rates as illustrated in Exhibit "F" attached:

EXHIBIT "F."

To	Miles	Scales Mich. 2 Lines	Ohio	Proposed
Genessee	131	122	125	125
Rogersville	134	122	125	125
Otisvile	137	122	125	125
Otter Lake	143	122	125	125
Fostoria	147	122	125	125
Mt. Morris	130	117	125	125
Clio	135	122	125	125
Birch Run	141	122	125	125
Blackmar	144	122	125	125
Bridgeport	150	122	125	125
Paines	164	127	135	135
Hemlock	174	132	135	135
Merrill	180	132	145	145
Wheeler	184	132	145	145
Breckenridge	186	132	145	145
St. Louis	193	137	145	145
Elwell	201	137	155	155
Riverdale	206	137	155	155
Vestaburg	210	137	155	155
Cedar Lake	213	137	155	155
Six Lakes	214	137	155	155
Lakeview	220	142	155	155
Amble	218	142	155	155
Oak	86	107	100	107
Beech	83	102	100	102
Elm	81	102	100	102
Stark	79	102	100	102
Salem	81	102	100	102
Green Oak	90	107	100	107
Island Lake	92	107	105	107
Brighton	95	107	105	107
Fowlerville	113	112	115	115
Webberville	118	117	115	117
Williamston	123	117	115	117
Lake Odessa	170	127	135	135
Freeport	186	132	145	145
Alto	184	132	145	145
McCords	187	132	145	145
Grandville	208	137	155	155
Jenison	209	137	155	155
Hudsonville	214	137	155	155
Vriesland	218	142	155	155
Zeeland	223	142	155	155
Waverly	227	142	165	165
New Richmond	238	142	165	165
Fennville	243	147	165	165
Pearle	246	147	165	165
Bravo	248	147	165	165
Pullman	250	147	165	165
Breedsville	260	147	175	175
Bangor	263	147	175	175
McDonald	267	147	175	175
Hartford	271	152	175	175
Watervliet	276	152	185	185
Coloma	278	152	185	185
Riverside	282	152	185	185
Benton Harbor	288	152	185	185
St. Joseph	290	152	185	185
Gowen	200	137	145	145
Wyman	211	137	155	155
Blanchard	217	142	155	155
Millbrook	220	142	155	155
Remus	225	142	155	155
Kent City	223	142	155	155
Casnovia	224	142	155	155
Bailey	228	142	165	165
Grant	232	142	165	165
Newaygo	238	142	165	165
White Cloud	249	147	165	165
Wooster	255	147	175	175

In cents per net ton

21044. To establish on **sand, lake,** carloads, from Gary, Ind., to Evansville, Ind., rate of $2.39 per net ton. Route—Via B. & O. R. R., Chicago, Ill., C. & E. I. R. R. Present rate, sixth class.

21053. To establish on **crushed stone,** in bulk, in open cars, carloads, from Gibsonburg, Maple Grove and Woodville, O., to various destinations, rates as shown in Exhibit "B" attached. Present and proposed rates as shown in Exhibit "B" attached:

EXHIBIT "B"

Comparative Statement, Carload Rates
Crushed Stone

To Penn. R. R. destinations

From Gibsonville, O. To	Prop.	Pres.
Bowerton, O.	$1.35	$1.50
Cadiz, O.	1.45	*4.10
Cadiz Jct., O.	.....	.....
Cambridge, O.	1.35	*3.70
Columbiana, O.	.....	.....
East Liverpool, O.	.....	.....
East Palestine, O.	1.45	*4.10
East Rochester, O.	1.35	1.50
Gnaddenhutton, O.	1.35	1.50
Lordstown, O.	.....	.....
Kensington, O.	1.35	1.50
New Comerstown, O.	1.25	1.40
New Waterford, O.	1.45	*4.10
Philadelphia Road, O.	.....	.....
Salem, O.	1.35	1.40
Salineville, O.	.....	.....
Steubenville, O.	.....	.....
Uhrichville, O.	1.35	1.50
From Maple Grove, O.		
Bowerston, O.	.....	.....
Cadiz, O.	.....	1.45
Cadiz Jct., O.	1.35	1.45
Cambridge, O.	.....	1.35
Columbiana, O.	1.35	1.40
East Liverpool, O.	1.45	1.50
East Palestine, O.	1.45	*4.00
East Rochester, O.	.....	1.35
Gnaddenhutton, O.	.....	1.25
Lordstown, O.	1.35	1.40
Kensington, O.	.....	1.35
New Comerstown, O.	.....	1.25
New Waterford, O.	1.35	*4.00
Philadelphia Road, O	1.25	1.45
Salem, O.	1.35	1.40
Salineville, O.	1.35	1.50
Steubenville, O.	1.45	1.50
Uhrichville, O.	.....	1.25
From Woodville, O.		
Bowerston, O.	.....	.....
Cadiz, O.	.....	.....
Cadiz Jct., O.	.....	.....
Cambridge, O.	.....	.....
Columbiana, O.	.....	.....
East Liverpool, O.	.....	.....
East Palestine, O.	1.45	*4.10
East Rochester, O.	1.35	1.50
Gnaddenhutton, O.	.....	.....
Lordstown, O.	.....	.....
Kensington, O.	1.45	1.50
New Comerstown, O.	.....	.....
New Waterford, O.	1.45	*4.10
Philadelphia Road, O.	.....	.....
Salem, O.	1.35	1.40
Salineville, O.	.....	.....
Steubenville, O.	.....	.....
Uhrichville, O.	.....	.....

*Sixth.

21058. To establish on **sand and gravel,** carloads, Lafayette, Ind., to Jefferson, Pickle and Clarks Mill, Ind., rate of 70c per net ton. Present rate, 75c per net ton.

21055. To establish on **crushed stone, sand and gravel and slag,** carloads, Chicago, Ill., and points taking same rates as shown in C. F. A. L. Tariff 197K, to various destinations, rates as shown in Exhibit "A" attached. Present and proposed rates as shown in Exhibit "A" attached:

EXHIBIT "A"

From Chicago, Ill., and points taking same rates as published in Agent Jones' 197K, I. C. C. 2079. In cents per net ton.

To	Present Rate—Crushed Stone	Sand & Gravel	Slag
Willow Creek, Ind.	88	92	88
Porter, Ind.	92	92	92
Furnessville, Ind.	92	92	92
Glendora, Mich.	101	115	126
Baroda, Mich.	101	115	126
Derby, Mich.	101	115	126
Vineland, Mich.	101	115	101
Hickory Creek, Mich.	101	115	101
St. Joseph, Mich.	115	115	126
Benton Harbor, Mich.	115	115	126
Cassopolis, Mich.	120	138	120
Three Rivers, Mich.	120	138	120
Wasepi, Mich.	120	138	120
Fairfax, Mich.	140	161	140
Findlay, Mich.	140	161	140
Colon, Mich.	140	161	140
Union City, Mich.	140	161	140
Homer, Mich.	140	161	140
Moscow, Mich.	161	161	189
Dowagiac, Mich.	120	138	120
Lawton, Mich.	120	138	120
Kalamazoo, Mich.	120	138	120
Grand Junction, Mich.	135	138	164
South Haven, Mich.	138	138	164
Augusta, Mich.	125	161	125
Battle Creek, Mich.	125	161	125
Wilders, Mich.	161	161	189
Eckford, Mich.	161	161	189
Marshall, Mich.	140	161	140
Albion, Mich.	140	161	140
Jackson, Mich.	140	161	140
Charlotte, Mich.	140	161	140
Hastings, Mich.	161	161	189
Caledonia, Mich.	161	161	189

To	Present Rate from Joliet, Ill. E. J. & E. I. C. C. 2122 Cr. Stone	Sand & Gravel	Slag	Prop. Rate
Willow Creek, Ind.	88	88	76	88
Porter, Ind.	65	65	50	88
Furnessville, Ind.	92	92	92	88
Glendora, Mich.	101	101	126	101
Baroda, Mich.	101	101	126	101
Derby, Mich.	101	101	126	101
Vineland, Mich.	101	101	101	101
Hickory Creek, Mich.	101	101	101	101
St. Joseph, Mich.	115	115	126	115
Benton Harbor, Mich.	115	115	126	115
Cassopolis, Mich.	120	120	120	120
Three Rivers, Mich.	120	120	120	120
Wasepi, Mich.	120	120	120	120
Fairfax, Mich.	140	140	140	125
Findlay, Mich.	140	140	140	125
Colon, Mich.	140	140	140	140
Union City, Mich.	140	140	140	140
Homer, Mich.	140	140	140	140
Moscow, Mich.	161	161	140	161
Dowagiac, Mich.	120	120	120	120
Lawton, Mich.	120	120	120	120
Kalamazoo, Mich.	120	120	120	120
Grand Junction, Mich.	135	135	164	135
South Haven, Mich.	138	138	164	138
Augusta, Mich.	125	125	125	125
Battle Creek, Mich.	125	125	125	125
Wilders, Mich.	161	161	140	140
Eckford, Mich.	161	161	140	140
Marshall, Mich.	.....	.....	.....	140
Albion, Mich.	140	140	140	140
Jackson, Mich.	140	140	140	140
Charlotte, Mich.	140	140	140	140
Hastings, Mich.	161	161	189	140
Caledonia, Mich.	161	161	189	161

21099. To establish on **sand and gravel,** carloads, from Lafayette, Ind., to points shown below, rates being in cents per net ton:

To	Pres.	Prop.
Deer Creek	88	70
Radnor	88	75
Ockley	88	75
Owasco	88	75
Rossville	88	75
Cambria	92	75

21093. To establish on **sand, lake, river and bank,** carloads, from Miller (Lake county), Ind., to Port Huron, Mich., rate of 165c per net ton. Present rate, 24½c, sixth class.

21095. To establish on **crushed stone and crushed stone screenings,** carloads, Holland, O., to Champion, O., rate of 75c per net ton. Present rate, classification basis.

21096. To establish on **sand and gravel,** carloads, Lafayette, Ind., to Coal City, Ill., rate of 101c per net ton, to apply via C. C. C. & St. L. Ry., Gardner, Ill., and C. & A. R. R. Present rate, sixth class.

21097. To establish on **sand and gravel,** carloads, Merom, Riverton, Ind., and Palestine, Ill., to Urbana, Ill., via I. C., Champaign, Ill., I. T. R. R., rate of 98c per ton of 2000 lb. Present rate, sixth class.

SOUTHERN FREIGHT ASSOCIATION DOCKET

44678. **Sand and gravel,** from Newport Sand Bank Co. Spur, Ind., to Southeastern points. It is proposed to amend Agent Speiden's Origin Basis Book No. 39J, I. C. C. 1157, by providing that rates on sand and gravel, carloads, from New Albany, Ind., will also apply from the Newport Sand Bank Co. Spur, Ind.

44694. **Limestone, ground, for agricultural purposes,** carloads, from Louisville, Ky. (when from Milltown, Ind.), to L. & N. R. R. stations in Kentucky. It is proposed to establish mileage scale of rates on limestone, ground (for agricultural purposes), carloads, from Louisville, Ky. (when from Milltown, Ind.), to L. & N. R. R. stations in Kentucky, within a radius of 80 miles of Louisville, the same as currently in effect on intrastate traffic between L. & N. R. R. stations in Kentucky, viz. (rates in cents per net ton):

Distance in miles	Rate
10 and under	50
20 and over 10	55
30 and over 20	60
40 and over 30	70
60 and over 40	80
80 and over 60	90

44696. **Ground and pulverized limestone and ground and pulverized marl,** carloads, minimum weight 60,000 lb., from Barber, Eagle Mountain, Indian Rock and Rocky Point, Va. (C. & O. Ry.), to stations on Elkin & Alleghany R. R. No rates now in effect. Proposed rate on the commodity mentioned, from and to above named points, 245c per net ton, made on basis of Elkin, N. C., combination, using beyond Elkin the proportion acceptable to the E. & A. R. R.

44739. **Limestone or marble,** ground or pulverized, from Sherwood, Tenn., to Southern Ry. stations. It is proposed to establish through rates on limestone or marble, ground or pulverized (See Note 1), except when car is loaded to full visible capacity actual weight will apply, from Sherwood, Tenn., to stations on the Southern Ry. on scale basis. Rates for representative distances will be as follows (in cents per net ton):

10 miles and over 5	99
55 miles and over 50	135
100 miles and over 95	176
150 miles and over 140	176
200 miles and over 190	185
250 miles and over 240	198

The suggested rates are made on the basis generally employed in making rates on this commodity between Southern points.

SOUTHWESTERN FREIGHT BUREAU DOCKET

17126. **Agricultural limestone,** from Limedale Spur, Ark., to points in Missouri and Arkansas. To establish the following distance scale of rates for application on agricultural limestone, carloads (for fertilizer purposes only), minimum weight marked capacity of car, but not less than 80,000 lb., from Limedale Spur, Ark., to points in Missouri and Arkansas on the Missouri Pacific R. R.:

Distance	Rates
20 miles and under	3
40 miles and over 20	3½
80 miles and over 40	4
120 miles and over 80	5
160 miles and over 120	6
220 miles and over 160	7

It is stated that farmers and orchardmen at various points on the Missouri Pacific R. R. are badly in need of limestone for fertilizing purposes. There is a supply of this commodity at Limedale Spur, Ark., and the rates proposed are as high as can be used in the distribution of this fertilizer. The rates proposed are also in in effect at points on the M. & N. A. Ry.

17140. **Chatt sand,** from points in Missouri to interstate points. To establish following rates in cents per ton of 2,000 lb. on chatt sand, carloads, minimum weight 100,000 lb., from Alba, Atlas, Aurora, Carthage, Granby, Joplin, Neck City, Oronogo, Porto Rico, Prosperity, Purcell and Webb City-Carterville, Mo., to points shown below:

To	Rates	To	Rates
Evansville, Ind.	315	Glenmont, O.	454
Geneva, Ind.	378	McDermott, O.	454
Kentland, Ind.	378	Sandusky, O.	454
Kokomo, Ind.	366	Amherst, O.	454
Osgood, Ind.	391	Toledo, O.	429
Irvington, Ky.	391	Sharon, Penn.	479
Louisville, Ky.	391	Pittsburgh, Penn.	542
Cincinnati, O.	391	Alexandria, Va.	739
Detroit, Mich.	429	Farmer, Ky.	429
Cleveland, O.	454	Olive Hill, Ky.	429
Columbus, O.	454	Bowling Gr'n, Ky.	391

Shippers state that the present rates are class rates and also rates based on combination of locals are prohibitive.

ILLINOIS FREIGHT ASSOCIATION DOCKET

4201. **Sand and gravel,** carloads (See Note 1), rates in cents per net ton, from Chillicothe, Ill., to Ft. Madison, Ia. Present rate, 111; proposed, 101.

4677. **Stone, broken, crushed or ground,** carloads, rates per net ton, from White Bear, Mo., to (representative points) Kinderhook, Arden, Bluffs and Jacksonville, Ill. Present, Class "E"; proposed, 110c.

4966. **Sand and gravel,** carloads (See Note 1), rates per net ton, from Palestine, Ill., to Urbana, Ill. Present, class rate; proposed, 98c.

4972. **Sand and gravel,** usual minimum weight, from Joliet, Ill. Rates per net ton.

To (Representative)	Pres.	Prop.
July, Ill.	88	76
Doney, Ill.	88	(1)76
Nelson, Ill.	88	(1)76
Cutmer, Ill.	101	(1)76

(1) Plus switching charge at point or origin of $2.70 per car.

4973. **Limestone, crushed or ground,** carloads, from Valmeyer, Ill., to Chicago, Ill. Present rate, 221c; proposed, 171c per net ton.

4411. **Stone, crushed, sand and gravel,** carloads (See Note 2), from Joliet, Ill., Millsdale, Ill., to Leslie, Ill. Present, class rates; proposed, 101c per ton.

2392. **Crushed stone,** carloads (See Note 3), from Lehigh, Ill., to T. P. & W. R. R. stations (rates in cents per net ton):

To (Representative points)	Pres.	Prop.
Civer, Ill.	151	126

Bushnell, Ill.	164	126
Scottsburg, Ill.	164	126
La Harpe, Ill.	190	126
La Crosse, Ill.	176	126
Hamilton, Ill.	176	126

3330A. **Sand and gravel,** carloads, usual minimum weight, from Chillicothe, Ill., to Virden, Ill. Present rate, combination; proposed, $1.13 per net ton.

4995. **Crushed stone,** carloads, and articles taking same rates, viz.: Cinders, slag, dirt, soil and strippings, in open top cars, also lime refuse, carloads, from Chicago and Thornton, Ill., to Pence, Finney, Freeland Park and Judyville, Ind. Present rate, 88c; proposed, 76c per net ton.

4997. **Crushed stone, sand and gravel,** carloads (See Note 2), from Joliet and Millsdale, Ill., to Enright, Ill. Present rate, $1.01; proposed, 88c per net ton.

4998. **Sand and gravel,** carloads (See Note 1), from Coleman and Munger, Ill., to Elmhurst, Ill. Present rate, 65c; proposed, 56c per net ton.

TRUNK LINE ASSOCIATION DOCKET

20486. (A) **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads; (B) **Sand, blast, engine, foundry, molding, glass, silica, quartz or silex,** carloads (See Note 2), from Mapleton District, Penn., to Steelton, Penn. (A) $1.05 and (B) $1.17 per net ton. Reason—The proposed rates are fairly comparable with rates on like commodities for like distances, services and conditions.

20487. **Gravel and sand** (other than blast, engine, foundry, glass, molding or silica), carloads (See Note 2), from Mt. Bethel, Portland and Stier, Penn., to Blairstown, N. J., 85c per net ton. Reason—The proposed rate compares favorably with rates on like commodities from and to points in the same general territory.

20491. **Crushed stone (limestone),** carloads (See Note 2), from Greer, W. Va., to Gates, Adah, Lambert, Masontown, Grays Landing, Martin, New Geneva, Poland and West Point Marion, Penn., 90c per net ton. Reason—The proposed rate compares favorably with rates now in force from Mostoller, Casparis, Penn., etc.

20496. **Crushed stone,** carloads (See Note 2), to Graters Ford, Penn., and Schwenksville, Penn. Rates in cents per 2000 lb.

From	Prop.
Birdsboro, Penn.	80
Barto, Penn.	80
Cedar Hollow, Penn.	75
Cold Point, Penn.	75
East Conshohocken, Penn.	75
Howellville, Penn.	75
Norristown, Penn.	75
Plymouth Meeting, Penn.	75
Stowe, Penn.	75
Trap Rock, Penn.	80
Vera Cruz, Penn.	75
West Conshohocken, Penn.	75
Williams, Penn.	75

Reason—To meet motor truck competition.

20274. **Crushed stone,** carloads (See Note 2), from Bound Brook, N. J., to Red Bank, N. J., 86c; to Little Silver, N. J., 92c per 100 lb.; and from Morrisville and Tullytown to Little Silver, N. J., 92c per 100 lb.

20497. **Crushed stone,** carloads (See Note 2), from Rheems, Penn., to Avondale, Penn., 90c, and to Mendenhall, Penn., $1.05 per net ton. Reason—The proposed rates are comparable with rates on like commodities for like distances, services and conditions.

20513. **Crushed stone,** carloads (See Note 2), from Le Roy, N. Y., to Andover, N. Y., $1 per net ton. Reason—The proposed rate is comparable with rates now in force to Horseheads, Dayton, N. Y., etc.

20517. (A) **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads; (B) **Sand, blast, engine, foundry, molding, glass, silica, quartz or silex,** carloads (See Note 2), from South Amboy and Old Bridge, N. J., to West Mahwah, N. J., (A) $1.84, (B) $1.84; to Ramapo, N. J., (A) $1.85, (B) $2 per net ton. Reason—The proposed rates are comparable with rates on like commodities for like distances, services and conditions.

20526. **Ground limestone,** carloads, minimum weight 50,000 lb., from Bellefonte and Pleasant Gap, Penn., to Cumberland to Hoffman, Md., and Allegany, Md., to Piedmont, W. Va., 11c per 100 lb. Reason—The proposed rates are fairly comparable with rates now in force from Ashcom, Penn.

20527. **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, and **gravel,** carloads (See Note 2), from Patapsco, Md.,

To	Rate
White Plains to La Plata, Md.	105
Cox to Popes Creek, Md.	125

Rates in cents per 2000 lb.

Reason—The proposed rates are fairly comparable with rates on like commodities from and to points in the same general territory.

20536. **Crushed stone,** carloads (See Note 2), from Stephens City, Va., to Valley R. R. points, Harrisonburg to Lexington, Va., rates ranging from $1.45 to $1.90 per net ton. Reason—The proposed rates are based 20c per ton over the old West Virginia Mileage Scale P. S. C. of W. Co., No. 1307.

20547. **Crushed stone,** carloads (See Note 2), from Le Roy, N. Y., to various P. S. & N. R. R. stations, Perkinsville, Garwood, Olean, N. Y., Smethport, Clermont, Drummond, Penn., and various, rates ranging from $1.10 to $1.60 per net ton. Reason—The proposed rates compare favorably with rates now in effect from Buffalo, N. Y., to the same points of destination.

20552. **Sand,** carloads (See Note 2), from all stations on the Raritan River R. R. to Summit, N. J., 92c per net ton. Reason—Proposed rates compare favorably with rates now in force from Framingdale, Hopatcong Jct. and Kenvil, N. J., to R. V. R. R.

20555. **Stone, crushed,** carloads (See Note 2), from White Haven, Penn., to Berwick, Penn., $1.30 per net ton. Reason—Proposed rate compares favorably with that in effect from White Haven to Shickshinny.

20578. **Sand, common or building** (not blast, engine, fire, foundry, glass, molding or silica sand), and **gravel,** carloads (See Note 2), from Winburne, Penn., to various destination on the N. Y. C. R. R., B. R. & P. Ry. and P. & S. R. R. in the state of Pennsylvania, Lawrenceville, Ansonia, Lock Haven, Mahaffey, St. Benedict, Wighton, Fernwood, Johnsonburg, Parkwood, Punxsutawney, Reynoldsville and various, rates ranging from 60c to $1.50 per net ton. Reason—Proposed rates are based on the scale ordered by P. S. C. of Pennsylvania, in P. S. C.—Penn. Dockets 7530 and 7533.

20588. **Ground limestone,** carloads, minimum weight 50,000 lb., from Roaring Springs, Penn., to Boyertown, Penn., 14½c per 100 lb. Reason—The proposed rates are comparable with rates from Bellefonte, Penn., to Boyertown, Barto and Philadelphia, Penn.

20593. **Sand, common or building** (not blast, engine, fire, foundry, glass, molding or silica), and **gravel,** carloads (See Note 2), from Tioga, Penn., to Nelson and Tompkins, Penn., 60c per net ton. Reason—The proposed rate is the same as the rate from Linden, Penn., to Avis and Youngdale, Penn., also is in accordance with P. S. C. in Penn. Dockets Nos. 7530 and 7553.

20601. **Stone, crushed, carloads** (See Note 2), from Stafford, N. Y. (rates per net ton):

To	Prop.
Alabama, N. Y.	$0.75
East Bergen, N. Y.	.75
Clarence Centre, N. Y.	.75
Elba, N. Y.	.83
Oakfield, N. Y.	.83
Rochester, N. Y.	.83
Pittsford, N. Y.	.91
Rands Siding, N. Y.	.91
Cambria, N. Y.	.91
Sanborn, N. Y.	.91
Barker, N. Y.	1.10

Reason—The proposed rates are comparable with rates to East Clarence, N. Y., Wheelers, Fishers and Lyndonville, N. Y.

20611. **Crushed stone,** carloads, and **sand** (other than blast, engine, fire, foundry, glass, molding, quartz, silex, silica and filter) and **gravel** (other than molding gravel), carloads (See Note 2), from Roeders, Penn., to Pottsville, Penn., 80c per 2000 lb. Reason—The proposed rate is comparable with rates on like commodities from and to points in the same general territory.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

16552. **Ground limestone,** minimum weight 60,000 lb., mileage commodity rates to apply locally between stations on the C. V. Ry., Rutland R. R., St. J. & L. C. R. R. and M. & W. R. R., as follows:

Not over 15 miles	4
Not over 30 miles	4½
Not over 45 miles	5
Not over 60 miles	5½
Not over 75 miles	6
Not over 90 miles	6½
Not over 105 miles	7
Not over 135 miles	7½
Not over 165 miles	8
Not over 195 miles	8½
Not over 225 miles	9

For joint application within the state of Vermont same scale will apply increased 1c per 100 lb., observing minimum rate in the joint application of 6c per 100 lb. Reason—The rates proposed are necessary to encourage the movement of waste material from lime producing points in the state of Vermont.

16559. **Limestone, ground, unburned or broken,** from North Adams, Mass., to Springfield, Mass., via B. & A. R. R., 7. Reason—To equalize rate via competitive route.

Increased Rates on Gravel Suspended

FREIGHT rate increases on gravel shipments in the Mississippi valley, effective March 1, were suspended by the Interstate Commerce Commission at Washington D. C.

Hearing of a protest filed by Mississippi agencies was set for April 8 at Memphis.

The action of the commission was in response to a petition addressed February 15 by six state agencies protesting increases in rates on gravel, sand, crushed stone and like commodities which, it was declared involved average raises of about 3% and would result in enormous additional costs of road-building in the Mississippi valley.

During 1929 alone, it was declared the road programs already set up for Mississippi, Tennessee and Kentucky would increase in cost nearly $2,000,000 if the rates granted prevailed. From figures obtained from the highway engineers of these states, it was estimated that the additional expense in Mississippi would amount to $511,200, Tennessee, $943,250 and Kentucky $471,625.

The increases amounted to approximately 30 cents per ton in these three states and in Louisiana where, although the total had not been figured, would amount to a very large sum, it was stated. The additional cost per mile of gravel roads would be about $1500, it was estimated, and about $1250 for an 18-ft. concrete road.

The agencies applying for the suspension, the Mississippi Railroad Commission attorney-general, State Highway Commission, Hattiesburg traffic bureau, Jackson traffic bureau and Meridian traffic bureau, contended in their petition that because of more favorable conditions in the Mississippi valley affecting train tonnages, average train loadings of gravel, sand and stone, this section is entitled to a lower basis of rates than the southeastern territory.

Evidence to show why lower rates should prevail in the Mississippi valley will be presented at the Memphis hearing.—*New Orleans* (La.) *Times.*

I. C. C. Decision

16407. Lime. Rates on this commodity from Martinsburg, Buckeley and Engle, W. Va., and Grove and Lime Kiln, Md., and Stephens City, Va., to metropolitan New York are found not to be prejudicial, and finding the record inadequate for the accomplishment of definite relationships between the rates paid by the complainant and those paid by its competitors, the commission, by division 2, has dismissed No. 16407. The commission found in the record that the rate structure was a hodge podge varying with the deliveries to be made and varying as to whether the lime was chemical, agricultural or building lime. Apparently no effort has been made to make the same rates for the same delivery.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Census of Concrete Products Manufacturers for 1927

Total of 2330 Plants Produced Products Valued at $93,259,206, According to the Dept. of Commerce Survey

THE Department of Commerce announces that, according to data collected at the biennial census of manufacturers taken in 1928, the establishments engaged primarily in the manufacture of concrete products in 1927 reported a total output valued at $93,259,206, an increase of 24% as compared with $75,213,986 reported for 1925, the last preceding census year. The principal items contributing to the total production are the following: Block and tile, 5,007,617 tons, valued at $37,165,102; cast stone, 324,105 tons $13,914,777; conduits and pipes, 1,860,217 tons, $24,291,427.

Classification of Plants Producing Cement Products in 1927

The establishments in this industry are engaged primarily in the manufacture of concrete products such as building blocks, tile, brick, cast stone, pipe, garden furniture, laundry trays, poles, posts, vaults, caskets, and miscellaneous products, made from crushed rock, gravel, or sand, bound together with cement. The classification does not cover concrete construction work on buildings, bridges, roads, etc.

Of the 2,330 establishments reporting for 1927, 272 were located in Pennsylvania, 233 in New York, 187 in Ohio, 186 in New Jersey, 183 in Michigan, 145 in Illinois, 141 in California, 106 in Indiana, 97 in Wisconsin, 84 in Minnesota, 79 in Massachusetts, 55 in Texas, 51 in Florida, 46 in Maryland, 45 in Iowa, 38 in Washington, 35 in Missouri, 26 in Nebraska, 23 in Connecticut, 23 in Kentucky, 23 in Virginia, 22 in Kansas, 22 in Oregon, 21 in North Carolina, and the remaining 187 in 22 other states. In 1925 the industry was represented by 1666 establishments, the increase to 2330 being the net result of gains and losses. Of the establishments gained, part reported for the first time at the present census and the remainder had reported products valued at less than $5000 for 1925. (No data for establishments manufacturing concrete products valued at less than $5000 are included in Table 1. Data for such establishments are included in Table 2, on the succeeding pages, for 1925 only. See footnote [*], Table 2.) Of the establishments lost, some were idle throughout the year, some went out of business prior to 1927, and others reported products valued at less than $5000 for 1927.

TABLE 1.—SUMMARY FOR THE INDUSTRY: 1927 AND 1925

	1927	1925	Per cent of increase
Number of establishments	2,330	1,666	39.9
Wage earners (average for the year)*	17,808	14,722	21.0
Wages†	$24,897,709	$20,761,376	19.9
Cost of materials, mill supplies, fuel and purchased power, total†	$33,913,086	$27,792,116	22.0
Materials and supplies	$32,530,175	‡	.....
Fuel and power	$ 1,382,911	‡	.....
Products, total value†	$93,259,206	$75,213,986	24.0
Concrete	$93,506,987	‡	.....
Other products and receipts for custom work	$ 752,219	‡	.....
Value added by manufacture§	$59,346,120	$47,421,870	25.1
Horsepower	54,342	38,361	41.7

*Not including salaried employes.

†The amount of manufacturers' profits cannot be calculated from the census figures, for the reason that no data are collected in regard to a number of items of expense, such as interest on investment, rent, depreciation, taxes, insurance, and advertising.

‡Not reported separately.

§Value of products less cost of material, mill supplies, fuel, and purchased power.

Tables of Statistics

The statistics for 1927 and 1925 are summarized in the accompanying tables. The figures for 1927 are preliminary and subject to such correction as may be found necessary after further examination of the returns.

[The above information together with the tables of statistics given on this page and the two succeeding pages are published by ROCK PRODUCTS to show the steady growth of the concrete products industry and to illustrate the wide diversity of the products being manufactured.—The Editors.]

Cement and Asbestos Seamless Pipe

ACCORDING to an announcement made by William R. Heigle, chairman of the board, the Johns-Manville Corp., has acquired the United States and Canadian rights for the manufacture and distribution of "Transite" seamless pipe made of asbestos fibre and portland cement.

The process for manufacturing "Transite" pipe produces a close grained, dense material which is readily cut, tapped and threaded with the same tools and in the same manner as iron pipe. Its weight is from 50% to 65% less than that of cast iron or steel pipe.

Due to its composition of nonmetallic materials it has a greater delivery capacity than new cast-iron or steel pipe and retains

it throughout the life of the pipe, it is claimed.

The new product will be manufactured both as a pressure pipe, for carrying liquids and solutions that must be carried under pressure, and flue pipe, for venting house heating boilers, automatic water heating boilers and drainage.

It is estimated the American market for this product runs over $100,000,000 per year.

Specially designed machinery for the manufacture of this pipe will be installed at the Johns-Manville plant at Waukegan, Ill. It is expected that production capacity will be reached early in the fall of this year.

Ready-Mix Concrete Plant for Scranton, Penn.

THE SCRANTON READY-MIXED CONCRETE CO. has been organized with a capital of $50,000 to produce and distribute concrete. A plant is being erected at the slag bank near the head of River street. Operations are expected to be started at the location at an early date.

The officers are: Edward Gogolin, president; Arthur Caldwell, vice-president, and Herman Gogolin, secretary-treasurer. — *Scranton* (Penn.) *Republican.*

Edray Artstone Advertising Co. Develops a New Concrete Sign

DEVELOPMENT of an entirely new use of cement and concrete is claimed by two Ohio men who have formed the Edray Artstone Advertising Co. and are placing concrete highway signs on some of the main roads of northern Ohio and nearby states. Edward Tiemeyer, a mason contractor of Lima, Ohio, and Ray Severns, a plastering contractor, also of Lima, are the two men who conceived the idea that a concrete sign can be both permanent and inexpensive. They have been at work on these signs for a little over a year and already the roadways, particularly near Lima, show numerous evidences of their work.

Essentially, the signs are constructed of a framework of structural iron and metallic lath stuccoed with portland cement concrete. The most common type made by the company is a two-faced sign which is set at right angles to the road so that it can be seen clearly from either direction. In making this sign, channel irons are set vertically, extending into the ground for a distance of about 3 ft. Horizontal angles and pencil rods, covered with metal lath, form the rest of the framework. On both sides of this ground work is applied a thick coat of stucco. The Edray company uses any number of colors in its work to produce artistic effects, and this original coat is put on in the color which is desired for the background of the finished sign. When this original stucco has hardened a second coat,

TABLE 2.—CONCRETE PRODUCTS, BY KIND, QUANTITY AND VALUE: 1927 AND 1925

(In making use of this report, it must be borne in mind that the figures relate solely to cement or concrete products. For example, the figures for brick refer only to brick made of cement and do not include data for brick made of clay.)

	1927	1925	Per cent of increase or decrease (—)
Aggregate value	$92,506,987	*$78,546,515	17.8
Building products:			
Total tons	5,677,353	5,018,522	13.1
Total value	$55,894,537	$50,583,875	10.5
Block and tile—			
Tons	5,007,617	4,183,945	19.7
Value	$37,165,102	$31,193,535	19.1
Brick—			
Tons	227,266	363,858	—37.5
Value	$ 1,636,368	$ 2,532,246	—35.4
Cast stone—			
Tons	324,105	354,164	—8.5
Value	$13,914,777	$12,843,418	8.3
Roofing tile—			
Total tons	118,365	116,555	1.6
Total value	$ 3,178,290	$ 3,538,601	—10.2
Large—			
Tons	91,717	‡	.....
Value	$ 2,401,426	‡	.....
Small—			
Tons	26,648	‡	.....
Value	$ 776,864	‡	.....
Circular structures:			
Total tons	151,738	111,392	36.2
Total value	$ 1,724,257	$ 1,424,406	21.1
Cistern and manhole blocks—			
Tons	44,299	27,940	58.6
Value	$ 373,030	$ 223,199	67.1
Silo blocks—			
Tons	43,636	34,043	28.2
Value	$ 554,100	$ 517,179	7.1
Staves and slabs—			
Tons	63,803	49,409	29.1
Value	$ 797,127	$ 684,028	16.5
Conduits and pipes:			
Total tons	1,860,217	1,283,429	44.9
Total value	$24,291,427	$17,761,032	36.8
Culvert pipe—			
Tons	344,774	349,389	—1.3
Value	$ 4,406,814	$ 4,480,831	—1.7
Draintile—			
Tons	95,033	79,919	18.9
Value	$ 840,254	$ 704,033	19.3
Electric conduits—			
Tons	11,473	1,857	517.8
Value	$ 267,097	$ 43,762	510.3
Hand-made pipe—			
Tons	66,175	‡	.....
Value	$ 928,559	‡	.....
Irrigation pipe—			
Tons	94,360	138,806	—32.0
Value	$ 1,252,901	$ 1,783,874	—29.8
Machine-made pipe—			
Tons	345,468	261,813	32.0
Value	$ 3,947,138	$ 3,617,445	9.1
Meter boxes—			
Tons	4,778	4,960	—3.7
Value	$ 128,708	$ 138,425	—7.0
Pressure pipe—			
Tons	78,184	46,503	68.1
Value	$ 2,157,144	$ 1,832,673	17.7
Sewer pipe, large—			
Tons	819,972	400,182	104.9
Value	$10,362,812	$ 5,160,009	100.8
Household accessories:			
Total tons	60,776	81,480	—25.4
Total value	$ 2,312,487	$ 2,650,772	—12.8
Garbage boxes—			
Tons	3,730	2,361	58.0
Value	$ 209,977	$ 128,095	63.9
Garden furniture—			
Tons	7,197	4,860	48.1
Value	$ 453,068	$ 467,173	—3.0

TABLE 2—(Continued from previous page)

	1927	1925	Per cent of increase or decrease (—)
Laundry trays—			
Tons	36,382	60,455	—39.8
Value	$ 1,199,784	$ 1,620,920	—26.0
Septic tanks and sanitary fittings—			
Tons	13,467	13,804	—2.4
Value	$ 449,658	$ 434,584	3.5
Paving products:			
Total tons	55,728	28,395	96.3
Total value	$ 649,748	$ 422,766	53.7
Crossing slabs—			
Tons	4,197	1,223	243.2
Value	$ 60,049	$ 17,107	251.0
Precast sidewalk slabs and curbing—			
Tons	38,447	22,229	73.0
Value	$ 417,100	$ 296,003	40.9
Precast units for railroad uses—			
Tons	13,084	4,943	164.7
Value	$ 172,599	$ 109,656	57.4
Poles and posts:			
Total tons	37,498	21,934	71.0
Total value	$ 1,808,120	$ 1,339,335	35.0
Fence posts—			
Tons	13,601	7,540	80.4
Value	$ 223,798	$ 146,736	52.5
Lighting standards—			
Tons	23,264	13,776	68.9
Value	$ 1,565,245	$ 1,171,620	33.6
Mail-box posts and transmission and trolley poles—			
Tons	633	618	2.4
Value	$ 19,077	$ 20,979	—9.1
Asbestos-cement art-marble floor tile, value	$ 308,703	$ 801,279	—61.5
Monuments and grave markers:			
Tons	2,000	2,245	—10.9
Value	$ 131,162	$ 92,794	41.3
Vaults and caskets:			
Tons	52,023	34,529	50.7
Value	$ 2,088,037	$ 1,681,853	24.2
Other concrete products§	$ 3,298,509	$ 2,264,458	45.7

*Includes data reported by establishments whose annual output was valued at less than $5000, and by builders and contractors. No corresponding data was tabulated for 1927.

†Does not include data for cement roofing tile valued at $476,075 (quantity not reported) made in establishments classified in the roofing-materials industry for 1925. Establishments manufacturing cement roofing tile were included in the concrete-products industry for 1927.

‡Not reported separately.

§Battery wells and boxes, chimney blocks, columns, concrete lumber and specials, cribbing, flush tanks, grease traps, grave copings, incinerators, lintels, mantels, marble mosaics, piers and pier blocks, piling, ready-mixed concrete, sills, terrazzo steps, troughs, vents, water tanks, and well curbing.

sometimes 2 in. or more in thickness, is applied. Before this second coat can harden the letters of the sign are outlined on it and all the stucco is removed by the use of a pointing trowel except the lettering. Thus the letters stand out in a bold relief 2 in. from the background, and since the second coat is of a different color from the first, the contrast is decidedly pronounced.

Any combination of two or more colors can be used in the signs, the variations only being limited by the number of colors which can be obtained for stucco. The signs maintain their sharp colors even after considerable exposure to the weather, some being noted which were about a year old and yet could not be differentiated from new signs. A remarkable feature of the signs is that they are not only permanent in character but that they can be readily changed if necessary. Another coat of stucco with new lettering is all that is necessary to completely alter the sign. Add to this advantage the feature of an attractive sign which utilizes both faces, and shows no unsightly props and one can readily see that the Edray company is putting out a remarkable product. The durability and resistence to wind pressures of the reinforced sign with its buried base is, of course, another feature.

Concrete Signs Not Expensive

Mr. Tiemeyer stated that a sign such as described above could be installed for practically the same cost as an ordinary sign. Moreover, there are great possibilities in unusual signs made under this system. One of the illustrations shows one of these signs apparently carved out of a great hillside rock. Instead the rock measures some 2 or 3 in. in thickness and is composed largely of structural iron and metal lath. But to look at it from the highway the deception is complete, and the sign is given a very impressive background. Similar uses of this system could be worked out.

An interesting use of rock products in connection with these signs is the dumping of about a cubic yard of gravel immediately in front of each sign. When this is spread over the area in front of the sign it keeps the weeds down to a great extent, thus cutting down "maintenance" cost—that is, the cost of keeping the sign clear of weeds that might cut off the public view.

Although the Edray company is building many of its own signs, it is also selling rights to other companies for the construction of signs in other localities. Rights in about ten Ohio counties have already been acquired by construction companies and advertising concerns, according to Mr. Tiemeyer. United States and Canadian patents have already been applied for and received.

One side of a double-faced concrete sign on which the letters are reproduced with different colored stucco

A concrete sign upon an apparent background of rock, which is really of stucco on a metal framework

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	1.75	1.60	1.30	1.30	1.30
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Farmington, Conn.	.....	1.30	1.10	1.00	1.00	.....
Frederick, Md.	.50– .75	1.35–1.45	1.15–1.25	1.10–1.20	1.05–1.15	1.05–1.10
Ft. Springs, W. Va.	.40	1.25	1.25	1.25	1.15	1.15
Munns, N. Y.	1.00	1.25	1.25	1.15	1.00	.....
Prospect, N. Y.	.80	1.25	1.15	1.15	1.15	.....
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
St. Vincent de Paul, Que. (n)	.70	1.50	1.50	1.00–1.25	.95	.90
Syracuse, N. Y.	.50	.....	1.00	1.00	1.00	1.00
Walford, Penn.	.....	.....	1.35h	1.35h	1.35h	1.35h
Watertown, N. Y.	1.00	1.75	1.75	1.50	1.50	1.50
West Chester, Penn.	5.00g	.....	.....	.....	.....	4.00k
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.	.....	.....	.....	.....	.50	1.50
Alton, Ill.	1.85	.....	.....	.....	.....	.....
Columbia and Krause, Ill.	1.05–1.40	.95–1.50	1.15–1.50	1.05–1.50	1.05–1.50	.....
Cypress, Ill.	.90–1.15	.90–1.15	1.00–1.15	1.00–1.20	1.00–1.15	1.00
Davenport, Iowa (f)	1.00	1.50	1.50	1.30	1.30	1.40
Dubuque, Iowa	.95	1.10	1.10	1.10	1.10	1.10
Stolle and Falling Springs, Ill.	1.05–1.40	.95–1.50	1.15–1.50	1.05–1.50	1.05–1.50	.....
Greencastle, Ind.	1.25	1.10	1.10	1.10	1.10	1.00
Lannon, Wis.	1.00	1.00	1.00	.90	.90	.90
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Marblehead, Ohio (l)	.55	.80	.80	.80	.80	.80
Milltown, Ind.	.....	.90–1.00	1.00–1.10	.90–1.00	.85– .90	.85– .90
Northern Ohio points	.85–1.15	1.25	1.15	1.15	1.15	1.15
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	1.10
Stone City, Iowa	.75	.....	1.20	1.05	1.00	.....
Thornton, Ill.	.90	1.00	1.25	1.25	1.25	1.25
Toledo, Ohio	1.10	1.70	1.70	1.70	1.70	1.70
Toronto, Canada	2.50	3.00	3.00	2.85	2.85	2.85
Valmeyer, Ill. (fluxing limestone)	.90–1.20	.....	.....	1.75	.....	1.75
Waukesha, Wis.	.....	.90	.90	.90	.90	.....
Winona, Minn.	1.00	1.20	1.30	1.40	1.40	1.40
Wisconsin points	.50	.....	1.00	.90	.90	.....
Youngstown, Ohio	.70j	1.25l–1.35h	1.25l–1.35h	1.25l–1.35h	1.25l–1.35h	1.25l–1.35h
SOUTHERN:						
Cartersville, Ga.	1.35	1.65	1.65	1.45	1.15	.....
Chico, Texas	.50	.50	1.25	1.15	1.10	1.00
Cutler, Fla.	.60r	.....	.....	1.75r	1.10r	.....
El Paso, Tex.	.50–1.25r	1.00–1.50	1.00–1.75	1.00–1.75	1.00–1.75	.....
Graystone, Ala.	Crusher run, screened, $1 per ton					
Olive Hill, Ky.	1.00	1.00	1.00	1.00	.90	.90
Rocky Point, Va.	.50– .75	1.40–1.60	1.30–1.40	1.15–1.25	1.10–1.20	1.00–1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.80
Blue Springs and Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.00	1.25	1.25	1.25	1.00	.....
Rock Hill, St. Louis, Mo.	1.45	1.45	1.45	1.45	1.45	1.45

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	1.20	1.60	1.45	1.35	.....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.25	1.60	1.35	1.25	1.25–2.00
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	.....
Northern New Jersey	1.35–1.40	1.40–2.10	1.90	1.50	1.50	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
Spring Valley, Calif.	.90–1.25	.90–1.25	.90–1.25	.90–1.25	.90–1.25	.90–1.25
Springfield, N. J.	1.40	2.00	1.90	1.60	1.60	.....
Toronto, Canada	.....	5.80	4.05	4.05	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	.....
Cayce, S. C.—Granite	.50	.....	1.75	1.75	1.60	.....
Eastern Pennsylvania—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Pennsylvania—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	1.00	.....	2.35	.....	.....	.....
Lithonia, Ga.—Granite	.75a	2.00b	1.75	1.35	1.25	1.25
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.	3.00–3.50	.....	2.00–2.25	2.00–2.25	.....	1.25–3.00
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Somerset, Penn. (sand-rock)	1.50 to 1.85					
Toccoa, Ga.—Granite	.....	1.40	1.40	1.35	1.25	1.25

(a) Sand. (b) to ⅛ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Price net after 10c cash discount deducted. (f) 1 in. to ¼ in., 1.45; 2 in. to ¾ in., 1.35. High calcite fluxing stone, 1.50. (g) Run of quarry. (h) Less 10c discount. (j) Less 10% net ton. (k) Rubble stone. (l) Less .05. (n) Ballast R. R., .90; run of crusher, 1.00. (p) Carloads prices. (q) Crusher run, 1.40; ¼-in. granolithic finish, 3.00. (r) Cubic yard.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.01% $MgCO_3$; 90% thru 100 mesh 4.00

Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh 1.50

Blackwater, Mo.—100% thru 4 mesh 1.00

Branchton, Penn.—Analysis, 94.89% $CaCO_3$; 1.5% $MgCO_3$; 50% thru 100 mesh 3.50–5.00

Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh 1.50

Cartersville, Ga.—90% thru 100 mesh, 2.00; 50% thru 50 mesh 1.50

Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk 2.50

Cypress, Ill.—Analysis, 95% $CaCO_3$, 2% $MgCO_3$; 90% thru 100 mesh, 1.35; 50% thru 100 mesh, 1.15; 90% thru 50 mesh, 1.15; 50% thru 50 mesh, 1.05; 90% thru 4 mesh, 1.10; 50% thru 4 mesh 1.00

Danbury, Conn., and West Stockbridge, Mass.—Analysis, 90% $CaCO_3$; 5% $MgCO_3$; fine ground, 90% thru 100 mesh; bulk 3.50
Paper bags 4.75
100-lb. cloth bags 5.25
(All prices less .25 cash 15 days)

Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 200 mesh, bags, per ton 6.00
90% thru 20 mesh, bulk, per ton 1.50

Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked 5.00

Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh; bags 3.95
Bulk 2.70

Jamesville, N. Y.—Analysis, 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags, 4.25; bulk 2.75

Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 90% thru 100 mesh 3.50

Knoxville, Tenn.—80% thru 100 mesh; bags, 3.95; bulk 2.70

Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk 1.75
Marl—Analysis, 95% $CaCO_3$; 0% $MgCO_3$; bulk 2.25

Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton 2.00

Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh 4.50

Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk 1.35–1.60

Olive Hill, Ky.—Analysis, $CaCO_3$ 94-98%; 50% & 90% thru 4 mesh 1.00

Piqua, Ohio—Total neutralizing power 101.12%; 99% thru 10, 60% thru 50; 45% thru 100 ..... 2.50
100% thru 10, 90% thru 50, 70% thru 100; bags, 5.00; bulk 3.50
100% thru 4, 30% thru 100, bulk 1.50

Rocky Point, Va.—Analysis, $CaCO_3$, 97%; $MgCO_3$, 75%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk 2.00

Watertown, N. Y.—Analysis, 53.72% $CaCO_3$; pulverized; sacks, 4.25; bulk 2.75

Agricultural Limestone

(Crushed)

Bedford, Ind.—Analysis, 98% $CaCO_3$; 1%, $MgCO_3$; 90% thru 10 mesh 1.50
30% thru 100 mesh 1.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Agricultural Limestone

Chico and Bridgeport, Tex. — Analysis, 95% $CaCO_3$; 1.3% $MgCO_3$; 90% thru 4 mesh	1.00–1.25
Charles-Town, W. Va.—Lime Marl—Analysis, 95% $CaCO_3$, 50% thru 100 mesh, bulk, 3.00; including burlap bags	4.50
Davenport, Ia.—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 10 mesh, per ton	1.25
90% thru 4 mesh, per ton	1.10
Dubuque, Iowa—Analysis, 54% $CaCO_3$; 38% $MgCO_3$; 50% thru 4 mesh	.95
Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh	1.00
Ft. Spring, W. Va. — Analysis, 90% $CaCO_3$; 50% thru 50 mesh	1.50
Kansas City, Mo.—50% thru 100 mesh	1.00
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio—90% thru 100 mesh	3.00
90% thru 50 mesh	2.00
90% thru 4 mesh	1.00
McCook, Ill.—90% thru 4 mesh	.90
Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Kokomo, Ind. —85% thru 10 mesh, 25% thru 100 mesh	1.50
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Mountville, Va. — Analysis, 76.60% $CaCO_3$; $MgCO_3$, 22.83%, 100% thru 20 mesh; 50% thru 100 mesh, paper bags, 4.50; burlap bags	5.00
Stolle and Falling Springs, Ill.—Analysis, 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh	1.10–1.70
Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh	2.10
Valmeyer, Ill.—Analysis, 96% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh	1.10–1.70

Pulverized Limestone for Coal Operators

Davenport, Ia.—Analysis 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; paper sacks	6.00
Hillsville, Penn., sacks, 4.50: bulk	3.00
Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 95% thru 100 mesh; paper bags (bags extra)	3.50
Marblehead, Ohio — Analysis, 83.54% $CaCO_3$; 14.92% $MgCO_3$; 99.8% thru 100 mesh; sacks	4.25
Piqua, Ohio, sacks, 4.50-5.00; bulk	3.00–3.50
Rocky Point, Va.—Analysis, 97% $CaCO_3$; 75% $MgCO_3$; 85% thru 200 mesh, bulk	2.25–3.50
Waukesha, Wis.—90% thru 100 mesh, bulk	4.00

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Cedarville and S. Vineland, N. J.	*1.75–2.25
Estill Springs and Sewanee, Tenn.	1.50
Franklin, Penn.	2.00
Klondike, Mo.	2.00
Massillon, Ohio	3.00
Michigan City, Ind.	.30– .35
Ohlton, Ohio	2.50
Ottawa, Ill.	1.25
Red Wing, Minn.	1.50
Rockwood, Mich.	2.25–3.00
San Francisco, Calif.	4.00–5.00
Silica and Mendota, Va.	2.00–2.50
St. Louis, Mo.	2.00
Utica and Ottawa, Ill.	.75–1.00
Zanesville, Ohio	2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.50
Dresden, Ohio		1.25
Eau Claire, Wis.	4.30	1.00–1.25
Estill Springs and Sewanee, Tenn.	1.35–1.50	1.35–1.50
Franklin, Penn.		1.75
Massillon, Ohio		2.00
Michigan City, Ind.		.30
Montoursville, Penn.		1.25
Ohlton, Ohio	1.75	1.75
Ottawa, Ill.	3.25	1.25
Red Wing, Minn.		1.00
San Francisco, Calif.	3.50	3.50
Silica, Va.		1.75

(Continued on next page)

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N. J.	.50	.50	1.15	1.40	1.40	
Attica and Franklinville, N. Y.	1.00	1.00	1.00	1.00	1.00	1.00
Boston, Mass.†	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.10	1.05	1.05	1.05	1.05	1.05
Erie, Penn.	.60	.85	1.30		1.30	
Leeds Junction, Me.		.50	1.75		1.25	1.00
Machias Jct., N. Y.	.75	.75	.75		.75	.75
Milton, N. H.		.50				.90
Montoursville, Penn.	1.00	.75	.80	.75	.70	.70
Northern New Jersey		.30– .50		.75–1.25	.75–1.25	
Somerset, Penn.		2.00				
South Portland, Me.		1.25	2.50			2.25
Troy, N. Y.	.50– .75*	.50– .75*	.80–1.00*	.80–1.00*		.80–1.00*
F. o. b. boat, per yd.	1.50	1.50	1.75	1.75		1.75
Washington, D. C.	.55	.55	1.20	1.20	1.00	1.00
CENTRAL:						
Algonquin, Ill.	.50	.35	.25	.45	.45	.50
Attica, Ind.			All sizes .75–.85			
Aurora, Moronts, Oregon, Sheridan, Yorkville, Ill.	.50	.35	.20	.50	.60	.60
Barton, Wis.		.40s	.65s	.65s	.65s	.65s
Chicago, Ill.	.50	.50–1.45n	.60	.60–1.55n	.60	.60–1.90x
Chicago, Ill.	.30	.20	.30	.40	.40	.45
Columbus, Ohio		.70‖	.70‖	.70‖	.70‖	
Des Moines, Iowa		.60	1.50	1.50	1.50	1.50
Eau Claire, Chippewa Falls, Wis.	.55	.55	.70	1.00	1.00	
Elkhart Lake, Wis.	.40	.40	.60	.60	.60	.50
Ferrysburg, Mich.		.50– .80	.60–1.00	.60–1.00		.50–1.25
Grand Haven, Mich.		.60		.90		.90
Grand Rapids, Mich.	.50	.50	.90	.80	.70	.70
Hamilton, Ohio		.60– .80	.60– .80		.60– .80	.60– .80
Hersey, Mich.		.50				.70
Humboldt, Iowa	.50	.50	1.40	1.40	1.40	1.40
Indianapolis, Ind.	.50– .60	.50– .60	.60– .75	.60– .75	.60– .75	.60– .75
Mankato, Minn.	.55	.45	.60		1.25h	
Mason City, Iowa	.50	.50	.85	1.25	1.25	1.25
Mattoon, Ill.			.75–.85 all sizes			
Milwaukee, Wis.	.91	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn. (g)	.35	.35	1.35	1.35	1.35	1.25
St. Louis, Mo. (b)	1.30e	1.30f	1.55t	1.55	1.55	1.65
St. Louis, Mo.†	2.00e	2.00f	2.25t	2.25	2.25	2.35
St. Paul, Minn.	.35	.35		1.25	1.25	1.25
Terre Haute, Ind.		.75	.75	.75	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	.50	1.10	1.10	1.25
SOUTHERN:						
Brewster, Fla.	.50	.50				
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Charleston, W. Va.			River sand and gravel, all sizes, 1.40			
Eustis, Fla.		.50				
Ft. Worth, Texas	1.00–1.15	1.00–1.15	1.00–1.10	1.00–1.35	1.10–1.35	1.00–1.25
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.00
Macon, Ga.	.65– .90	.65– .90	2.25–2.50	2.25–2.50	2.25–2.50	2.25–2.50
New Martinsville, W. Va.	1.10	1.00		1.30	1.10	.90
Roseland, La.	.30	.30	1.00	1.25	.80	
WESTERN:						
Kansas City, Mo.	.70– .80	.70– .75				
Crushton, Durbin, Kincaid, Largo, Rivas, Calif.	.10– .40	.10– .40	.50–1.00	.50–1.00	.50–1.00	.50–1.00
Oregon City, Ore.			All grades range from 1.00 to 1.25 per cu. yd.			
Otay, Calif.		.35– .40	.50– .60	.50– .60	.50– .60	.50– .60
Phoenix, Ariz. (k)	1.25*	1.15*	1.50*	1.15*	1.15*	1.00*
Pueblo, Colo.	.80	.60		1.25		1.15
Seattle, Wash.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Steilacoom, Wash.	.50	.50	.50	.50	.50	.50

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.			.40			
Brookhaven, Miss.						.60
Buffalo, N. Y.	1.10	.95		.85		.95
Burnside, Conn.		.75*				
Chicago, Ill.	1.25m			.35		
Des Moines, Iowa		.75				
Dresden, Ohio				.70	.65	
Eau Claire, Chippewa Falls, Wis.					.65	
Fort Worth, Texas						.75–1.00
Gainesville, Tex.					.55	
Grand Rapids, Mich.				.50		
Hamilton, Ohio					.35– .50	
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Macon, Ga.	.35					
Mankato, Minn.	.70					
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Roseland, La.				.60	.60	.60
Somerset, Penn.		1.85–2.00		1.50–1.75		
Steilacoom, Wash.	.25					
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.						.60
York, Penn.	1.10	1.00				

*Cubic yd. †Delivered on job by truck. (a) ⅝-in. down. (b) 1½- to ¾-in., 1.65. (c) 2½-in. and less. ‖By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd. (e) Mississippi River. (f) Meramee River. (g) Per yd., del. by truck, ¼-in. down, 1.25; 2 in. and less, 2.40. (h) ¾-in. and larger. (j) Lake sand, 1.75, delivered. (k) 60–70% crushed boulders. (m) Cu. yd., dune sand, f.o.b. cars, Chicago. (n) Cu. yd., f.o.b. cars, Chicago. (r) Pit run. (s) Plus 15c for winter loading. (t) Fine and regular binder. (u) Coarse, torpedo, also roofing. (v) Coarse binder. †2% discount if paid by 15th of month following delivery.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.00	2.00	2.00	1.00–2.25		1.50–3.50	
Beach City, Ohio	1.75	1.75		1.50	1.50		
Dresden, Ohio	1.25–1.50	1.25–1.50	1.50–1.75	1.00–1.25			
Eau Claire, Wis.						3.00	
Elco and Murphysboro, Ill.	Water-floated ground silica per ton in carloads—18.00–31.00						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35–1.50	
Franklin, Penn.	2.00	1.75		1.75			
Kasota, Minn.							1.00
Kerrs, Ohio	1.10–1.50	1.25–2.00	2.00			2.75–3.00	
Klondike, Mo.	2.00			2.00			
Massillon, Ohio	2.25	2.25		2.25	2.50		
Michigan City, Ind.				.30– .35			
Montoursville, Penn.				1.50–1.60			
New Lexington, Ohio	2.00	1.75					
Ohlton, Ohio	1.75	1.75		2.00	1.75	1.75	
Ottawa, Ill.	1.25	3.00	1.25	1.25	1.25	3.50	3.00
Red Wing, Minn. (d)					1.50	3.00	1.50
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50–5.00†	3.50–5.00†	3.50–5.00†	
Silica, Mendota, Va.		Potters sand, 8.00–10.00g					1.75
Utica and Ottawa, Ill.	.40–1.00f	.40–1.00f	.75–1.00	.40–1.00f	.60–1.00f	2.23–3.25	1.00–3.25
Utica, Ill.	.60	.70		.75	1.00		
Warwick, Ohio	1.50*–2.00h	1.50*–2.00h		1.50*–2.00h			
Zanesville, Ohio	2.00	1.50	2.00	2.50	2.00		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (d) Filter sand, 3.00. (e) Filter sand, 3.00–4.25. (f) Crude and dry. (g) Also 12.00; building sand, 1.75–2.00. (h) Washed, 1.75.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Erie and Dubois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern New Jersey	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.50	1.00		1.25			
Western Pennsylvania	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio		1.30*		1.45*	1.45*	1.45*	
Jackson, Ohio	2.05*	1.05*	1.80*	1.30*	1.05*	1.30*	1.30*
Toledo, Ohio	1.50	1.10	1.25	1.25	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.	2.05*	1.45*	1.80*	1.45*	1.45*	1.45*	1.45*
Ensley and Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.†	2.05	.55*		1.15*	.90*	.90*	

5c per ton discount on terms. †1¼ in. to ¼ in., $1.05; ⅝ in. to 10 mesh, $1.25*; ⅝ in. to 0 in., .90*; ¼ in. to 10 mesh, .80*.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.00
Buffalo, N. Y.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[10]
Lime Ridge, Penn.							5.00	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00[13]
Williamsport, Penn.	10.00–11.00	8.50–9.00	8.50–9.00		7.00	9.00	5.00	
York, Penn., & Oranda, Va.	11.50†	8.50–9.50†	8.50–9.50†	8.50–10.50†	8.00	9.25	7.00	1.40[8]
CENTRAL:								
Afton, Mich.						10.00	7.50	
Carey, Ohio	11.50	7.50	7.50		8.00		7.50	1.50
Cold Springs, Ohio		7.50	7.50				8.00	
Gibsonburg, Ohio	11.50		7.50		8.00	10.00	8.00	
Huntington, Ind.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[10]
Luckey, Ohio	11.50							
Milltown, Ind.		8.50–10.00		10.00[8]			8.50[32]	1.35[10]
Ohio points	11.50	7.50	7.50	12.00	8.00	11.00[23]	7.50	1.50[16]
Scioto, Ohio	11.50	7.50	7.50	8.50	8.25	.62½	7.00	1.50
Sheboygan, Wis.		10.50					9.50	2.00[4]
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio	11.50	7.50	7.50	12.50	8.00	10.00[9]	8.00	1.50[8]
SOUTHERN:								
El Paso, Texas							7.00	1.50
Frederick, Md.		8.00–9.50	8.00–9.50			9.50[15]	7.00[15]	
Graystone & Landmark, Ala.	12.50	9.00		12.50	8.50		7.50	1.35
Keystone, Ala.		9.00	8.00	9.00	9.00	11.00	7.50	1.35
Knoxville, Tenn.	19.00	9.00	9.00	9.00			7.50	1.35
Ocala and Kendrick, Fla.		11.00		12.00				
WESTERN:								
Kirtland, N. M.							10.00	
Los Angeles, Calif.	15.00	14.00	12.00	18.00			13.50	
San Francisco, Calif.	19.00	17.50	13.00	17.50–19.00	14.50	.90[17]	14.50[19]	1.85[17]
Tehachapi, Calif.[18]	10.80		6.75[11]	12.00			10.30	
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel 1.70. [4] Steel; in bbl. .95. [5] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] In paper bags, including bags. [8] To 11.00. [9] 80-lb. [10] In bags. [11] Refuse or air slack, 10.00–12.00. [12] To 3.00. [13] Delivered in Southern California. [15] To 8.00. [16] To 1.70. [17] Less credit for return of empties. [18] 90-lb. sacks. [19] To mortar plant and large industrials, 13.00. [23] To 9.00. [32] Per bbl., 2.15. [60] To 16.50.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing sand	Traction
Utica and Ottawa, Ill.	1.00–3.25	.75
Warwick, Ohio		2.00
Zanesville, Ohio		2.50

*Damp.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:	
Ground talc (20-50 mesh), bags	5.75– 8.50
Ground talc (150-200 mesh), bags	7.00–15.00
Pencils and steel crayons, gross	.75– 2.50
Chester, Vt.:	
Ground talc (150-200 mesh), paper bags	7.00– 8.00
Same, including 50-lb. bags	8.00– 9.00
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Conowingo, Md.:	
Crude talc, bulk	4.00
Ground talc (150-200 mesh), in bags	14.00
Cubes, blanks, per lb.	.10
Dalton, Ga.:	
Crude talc (for grinding)	4.00
Ground talc (150-200 mesh), bags	9.00
Pencils and steel worker's crayons, per gross	1.00– 2.00
Emeryville, N. Y.:	
(Double air floated) including bags:	
200 mesh	13.75
325 mesh	14.75
Hailesboro, N. Y.:	
Ground talc (300-350 mesh) in 200-lb. bags	15.50–20.00
Henry, Va.:	
Crude (mine run)	3.50– 4.00
Ground talc (150-200 mesh), bags	6.25–10.50
Joliet, Ill.:	
Ground talc (200 mesh) in bags:	
California white	30.00
Southern white	20.00
Illinois talc	10.00
Crude talc	3.75
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00–30.00
Natural Bridge, N. Y.:	
Ground talc (300-325 mesh), bags	12.00–15.00

(a) Bags extra.

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Columbia, Tenn.—B.P.L. 65-70%	3.50– 4.50
Gordonsburg, Tenn.—B.P.L. 68-72%	4.00– 4.50
Mt. Pleasant, Tenn.—B.P.L., 77%	6.50
Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00– 9.00

Ground Rock

(2000 lb.)

Centerville, Tenn.—B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 68%	3.50
B.P.L. 72%	4.50
Mt. Pleasant, Tenn.—Lime phosphate:	
B.P.L., 72.50%, 80% thru 300 mesh	11.70
B.P.L. 72%	5.50– 6.00
Twomey, Tenn.—B.P.L. 65%	8.00
Wales, Tenn.—B.P.L. 65%	11.00

Florida Phosphate

(Raw Land Pebble)

(Per Ton)

Florida—F.o.b. mines, gross ton, 68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

New York City, N. Y.—Per lb.,	
Cut mica (1½x2)	1.60
Cut mica (8x10)	26.00
Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.96
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—Per ton,	
Mine run	300.00
Clean shop scrap	25.00
Mine scrap	22.50–24.00
Roofing mica	37.50
Punch mica, per lb.	.12

Cut mica—50% from Standard List.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, and American Botticino, coral pink	¶12.50–‖14.50	¶12.50–‖14.50
Brighton, Tenn.—Pink marble chips	§3.00	§3.00
Crown Point, N. Y.—Mica spar		b9.00–‖12.00
Davenport, Ia.—White limestone, in bags	6.00	6.00
Easton, Penn.—Royal green	16.00–18.00a	
Harrisonburg, Va. — Bulk marble (crushed, in bags)	12.50–14.00	12.50–14.00
Ingomar, Ohio — Concrete facings and stucco dash		11.00–18.00
Middlebrook, Mo.—Red		20.00–25.00
Middlebury, Vt. — Middlebury white		†9.00–‖10.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags		5.50
Phillipsburg, N. J.—Royal green granite		16.00–20.00
Randville, Mich.—Crystalite white marble, bulk	4.00	4.00– 7.00
Stockton, Calif.—"Nat-rock" roofing grits		12.00–20.00
Tuckahoe, N. Y.—Tuckahoe white	8.00	
Warren, N. H.		¶7.90–‖8.95
Wauwatosa, Wis.		20.00–32.00
Wellsville, Colo.—Colorado Travertine Stone	15.00	15.00
Whitestone, Ga.		*10.00

†C.L.; L.C.L. 16.00. ¶C.L. ‖L.C.L. (a) Including bags. (b) In 100-lb. bags, car lots, min. car 20 tons. * Per 100 lb.

Potash Feldspar

Auburn and Topsham, Me.—Color white, 98% thru 140-mesh	19.00
Buckingham, Ore. — White, analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y. — Color, white; analysis, K_2O, 9.63%; Na_2O, 1.01%; SiO_2, 69.72%; Fe_2O_3, .00%; Al_2O_3, 18.6% (crude); bulk, per ton	9.00
East Hartford, Conn. — Color, white, 40 mesh to 200 mesh	15.00–28.00
East Liverpool, Ohio — Color, white; 98% thru 200 mesh, bulk	19.35
Soda feldspar, crude, bulk, per ton	22.00
Glen Tay Station, Ont.—Color, red or pink; analysis, K_2O, 12.81%; crude	7.00
Keystone, S. D.—White; bulk (crude)	8.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 19.20%; Arizona spar, crude, bags, 12.50–14.00; bulk	11.00–12.50
Pulverized, 95% thru 200 mesh; bags, 19.73–23.50; bulk	15.75–22.50
Pulverized, 20% thru 80 mesh; bags, 17.60; bulk	16.50
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—White; crude, bulk	8.00
Ground, bulk	16.50
Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; bulk (Bags 15c extra.)	18.00
Tennessee Mills—Color, white; analysis, K_2O, 10%; Na_2O_3, 3%; SiO_2, 68%; 99½% thru 200 mesh; bulk (Bags, 15c extra)	18.00
Toronto, Can.—Colo, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50– 8.00

Chicken Grits

Afton, Mich.—(Limestone), per ton	1.75
Belfast, Me.—(Limestone), per ton	‡10.00
Chico, Tex.—Hen size and Baby Chick, packed in 100-lb. sacks, per sack	1.00
Danbury, Conn.; Adams, Ashley Falls, and West Stockbridge, Mass.—(Limestone)	‡7.50–*9.00
Davenport, Ia.—(Limestone), bags, per ton	6.00
Easton, Penn.—In bags	8.00
El Paso, Tex.—Per ton	1.00
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—Per ton, including sacks:	
Feldspar	14.00
Gypsum	7.50– 9.50
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton (a)	10.00
Randville, Mich.—(Marble), bulk	6.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Gypsum), bulk, per ton	10.00
Tuckahoe, N. Y.	8.00
Waukesha, Wis.—(Limestone), per ton	7.00
Wisconsin Points—(Limestone), per ton	15.00
Winona, Minn.—(Limestone), sacked, per ton, 8.00; bulk, per ton	6.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags. (a) F.o.b. Middlebury, Vt.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	11.00
Anaheim, Calif.	10.50–11.00
Barton, Wis.	10.50g
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Brownstone, Penn.	11.00
Dayton, Ohio	12.50–13.50
Detroit, Mich. (h)	j13.00–16.00*d
Farmington, Conn.	13.00
Flint, Mich.	18.00†
Grand Rapids, Mich.	12.50
Hartford, Conn.	13.00–17.00*
Jackson, Mich.	13.00
Lakeland, Fla.	10.00–11.00
Lake Helen, Fla.	9.00–12.00
Lancaster, N. Y.	12.25
Madison, Wis.	12.50a
Mishawaka, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00
New Brighton, Minn.	12.75
Pontiac, Mich.	12.50
Portage, Wis.	15.00
Prairie du Chien, Wis.	18.00–22.50
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas	12.50
Sebewaing, Mich.	12.50
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
South St. Paul, Minn.	9.00
Syracuse, N. Y.	18.00–20.00
Toronto, Canada (f)	15.00†e
Wilkinson, Fla.	12.00–16.00
Winnipeg, Canada	15.00

*Delivered on job. †5% disc. 10 days. ‖Dealers' price. (a) Less 50c disc. per M, 10th of month. (d) 5% disc., 10th of month. (e) Delivered. (f) F.o.b. yard, 12.50. (g) Delivered Milwaukee, 13.00. (h) Also 15.50. (j) Also 14.00.

Portland Cement

	Per Bag	Per Bbl.	High Early Strength
Atlanta, Ga.		2.36	3.51¶
Baltimore, Md.		2.25–2.65	3.55¶
Birmingham, Ala.		2.00	3.44¶
Boston, Mass. (g)	.68¾	2.23–2.73e	3.27¶
Buffalo, N. Y.	.62½	2.10†	3.40¶
Butte, Mont.	.90¼	3.61	
Cedar Rapids, Iowa		2.24	
Charleston, S. C.		2.25–2.65d	3.58¶
Cheyenne, Wyo.	.64	2.56	
Chicago, Ill.		2.05–2.45	3.35¶
Cincinnati, Ohio		2.22–2.62	3.52¶
Cleveland, Ohio		2.24–2.64	3.54¶
Columbus, Ohio		2.22–2.62	3.52¶
Dallas, Texas		1.80	3.39¶
Davenport, Iowa		2.24	
Dayton, Ohio		2.22–2.64	3.54¶
Denver, Colo.	.63¾	2.55	
Des Moines, Iowa		2.14	
Detroit, Mich.		1.95–2.35	3.27¶
Duluth, Minn.		2.04	
Houston, Texas		1.90	3.63¶
Indianapolis, Ind.	.54¾	2.09–2.49	3.39¶
Jackson, Miss.		2.04–2.44	3.53¶
Jacksonville, Fla.		2.60b	3.79¶
Jersey City, N. J.		2.13–2.53	3.43¶
Kansas City, Mo.	.45½	1.82	3.22¶
Los Angeles, Calif.	.55	2.20	
Louisville, Ky.	.55½	2.57	3.47¶
Memphis, Tenn.		2.04–2.44	3.34¶
Milwaukee, Wis.		2.20–2.60	3.50¶
Minneapolis, Minn.		2.12–2.22	
Montreal, Que.		1.60	
New Orleans, La.	.45½	1.82	3.72¶
New York, N. Y.	.60¾	1.93–2.43	3.33¶
Norfolk, Va.		1.97	3.27¶
Oklahoma City, Okla.	.57¼	2.29	3.69¶
Omaha, Neb.	.54	2.16	3.56¶
Peoria, Ill.		2.22	
Philadelphia, Penn.		2.05–2.15	3.45¶
Phoenix, Ariz.		3.91*	
Pittsburgh, Penn.		2.05–2.44	3.34¶
Portland, Ore.‡		2.40–2.90a	
Reno, Nev.‡		2.91–3.41a	
Richmond, Va.		2.32–2.72	3.62¶
Salt Lake City, Utah	.70¼	2.81	
San Francisco, Calif.‡		2.21–2.71a	
Savannah, Ga.		2.60c	3.65¶
St. Louis, Mo.	.48¾	1.95–2.35	f3.25¶
St. Paul, Minn.		2.12–2.22	
Seattle, Wash.		†2.50–2.65j	f3.50†
Tampa, Fla.		2.40	4.08¶
Toledo, Ohio		2.20–2.60	3.50¶
Topeka, Kans.	.50¼	2.01	3.41¶
Tulsa, Okla.	.53¼	2.13	3.53¶
Wheeling, W. Va.		2.12–2.52	3.42¶
Winston-Salem, N. C.		2.29–2.69	3.59¶
Mill prices f.o.b. in carload lots, without bags, to contractors.			
Albany, N. Y.	.43¾	1.75	
Bellingham, Wash.		2.10	
Buffington, Ind.		1.80	
Chattanooga, Tenn.		2.45*	
Concrete, Wash.		2.35	
Davenport, Calif.		2.05	
Hannibal, Mo.		1.90	
Hudson, N. Y.		1.75	
Leeds, Ala.		1.65	
Lime and Oswego, Ore.		2.50‡	
Mildred, Kan.		2.35	
Nazareth, Penn.		2.15	
Northampton, Penn.		1.75	
Richard City, Tenn.		2.05	
Steelton, Minn.		1.85	
Toledo, Ohio		2.20	
Universal, Penn.		1.80	

NOTE—Add 40c per bbl. for bags. *Includes sacks. †10c disc., 10 days. ‡10c disc., 15 days. (a) Includes cloth sacks returnable at 10c each. (b) 24c bbl. refund for paid freight bill. (c) 35c bbl. refund for paid freight bill. (d) 40c bbl. refund for paid freight bill. (e) 45c bbl. foreign refund. (f) "Velo" cement, including cost of paper bag. ¶ "Incor" Perfected prices per bbl. packed in paper sacks, subject to 10c disc. 15 days. (g) Also 2.33 per bbl. (j) 25c bbl. disc. 10 days.

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x 36". Per M Sq. Ft.	½x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
Acme, Tex.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Blue Rapids, Kan.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Des Moines, Iowa	3.00	8.00	9.00	10.00	10.00	10.50	13.50	12.00	24.00	22.00	18.00	21.00	30.00
Detroit, Mich.					14.30o	12.30m		m9.00–11.00o					
Delawanna, N. J.				4.50–5.00	13.10–14.00	5.00		7.25					25.00
East St. Louis, Ill.	Special Gypsum Products—Interior partition section, 4 in. wide, 12 in. thick and up to 10 ft. 6 in. long, per ton, 21.00; 6x6 in. and up to 10 ft. 6 in. long, per ton, 30.00; floor section, 7x16 in. and up to 13 ft. 6 in. long, per ton, 23.00.												
Ft. Dodge, Iowa; N. Holston, Va.; Akron, N. Y.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Grand Rapids, Mich.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Gypsum, Ohio	1.70–3.00	4.00	6.00	7.00–9.00	9.00	9.00	19.00	7.00	24.50	19.00		15.00	20.00–25.00
Los Angeles, Calif. (f)		7.50–9.50	7.50–9.50	8.50–10.00	9.00–11.00		9.00–11.00		29.00–34.00				
Medicine Lodge, Kan.	1.70	4.00							15.00			15.00	20.00
Oakfield, N. Y.	2.50			5.50	6.00	6.00		5.50				15.00	25.00
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00		20.00	30.00
Portland, Colo.				10.00									
Providence, R. I.				13.00							Partition block, solid reinforced, 12x30x3", 7c per sq. ft. in truck lots		
San Francisco, Calif.			9.00	13.40	14.40		15.40						
Seattle, Wash.		10.00m	10.00m	13.00m			14.00		23.00				
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00							33.00

NOTE—Returnable bags. 10c each; paper bags, 1.00 per ton extra (not returnable. (a) Hardwall plaster, 13.00; casting, finishing molding, 14.00; (b) Calacoustic plaster, 10.00 at mill; (c) Plaster lath; (d) ¼x48x36 in.; (f) plasterboard, 18c to 20c per yd.; (m) includes paper bags; (o) includes jute sacks; (u) includes sacks; (v) retail, 35.00.

Market Prices of Cement Products and Slate

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

City or shipping point	Size 8x8x16
Camden, N. J.	17.00
Cement City, Mich.	55.00¶
Chicago District‖	180.00–210.00a
8x10x16	230.00–260.00a
8x12x16	280.00–330.00a
Columbus, Ohio	13.00
Detroit, Mich. (d)	.15– .17†
Forest Park, Ill.	21.00*
Grand Rapids, Mich.	11.00*
Graettinger, Iowa	.18– .20
Indianapolis, Ind.	.10– .12a
Los Angeles, Calif.	4x8x12–5.00*
Olivia and Mankato, Minn.	9.50b
Somerset, Penn.	.18– .20
Tiskilwa, Ill.	.16– .18†
Yakima, Wash.	20.00*

*Price per 100 at plant. †Rock or panel face. ‡Delivered. ¶5x8x12, 55.00 per 1000. (a) Face. (b) Per ton. (c) Plain. (d) 8x12x16, rock or panel face, .24–.26.

Cement Building Tile

Cement City, Mich.:	
5x8x12, per 100	5.00
Chicago District (Haydite):	
4x 8x16, per 100	14.00
8x 8x16, per 100	20.00
8x12x16, per 100	28.00
Columbus, Ohio:	
5x8x12, per 100	6.50
Detroit, Mich.:	
5½x8x12, per M	75.00
Grand Rapids, Mich.:	
5x8x12, per 100	6.00
Longview, Wash.:	
4x6x12, per 100	5.00
4x8x12, per 100	6.25
Mt. Pleasant, N. Y.:	
5x8x12, per M	78.00
Houston, Texas:	
5x8x12 (Lightweight), per M	80.00

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.:	
Red	15.00
Green	18.00
Cicero, Ill.—French and Spanish, 8x15, per sq., red, 11.50; green	13.50
English 7½x15½ per sq., red 18.00; green	20.00
Detroit, Mich.—5x8x12, per M	67.50
Houston, Texas—Roofing Tile, per sq.	25.00
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Waco, Texas:	Per sq.
4x4	.60
Pasadena, Calif. (Stone Tile):	
3½x4x12, per 100	3.00
3½x6x12, per 100	4.00
3½x8x12, per 100	5.50
Tiskilwa, Ill.;	
8x8, per 100	15.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	
3½x6x12, per M	50.00
3½x8x12, per M	60.00
Prairie du Chien, Wis.:	
5x8x12, per M	82.00
5x4x12, per M	46.00
5x8x6 (half-tile), per M	41.00
5x8x10 (fractional), per M	82.00
Yakima, Wash. (Building Tile):	Each
5x8x12	.10

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00– 40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00– 50.00
Camden & Trenton, N. J.	17.00	.....
Chicago District "Haydite"	14.00	.....
Columbus, Ohio	16.00	17.00
El Paso, Tex.—Klinker	10.00	.....
Ensley, Ala. ("Slagtex")	12.50	.....
Eugene, Ore.	25.00	35.00– 75.00
Forest Park, Ill.	.....	37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50– 65.00
Los Angeles, Calif.	12.50	.....
Milwaukee, Wis.	14.00	30.00
Mt. Pleasant, N. Y.	.....	14.00– 23.00
Omaha, Neb.	18.00	30.00– 40.00
Pasadena, Calif.	10.00	.....
Philadelphia, Penn.	15.50	17.50
Portland, Ore.	17.50	23.00– 55.00
Mantel brick—100.00–150.00		
Prairie du Chien, Wis.	14.00	22.00– 25.00
Rapid City, S. D.	18.00	30.00– 40.00
Waco, Texas	16.50	32.50–125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	.....

*40% off List.

Wholesale Prices of Slate

Prices given are f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened 200 mesh, $7.00 per ton in paper bags.

Slate Granules

Esmont, Va.—Blue, $7.50 per ton.

Granville, N. Y.—Red, green and black, $7.50 per ton.

Pen Argyl, Penn.—Blue-black, bulk, $6.00 per ton.

Roofing Slate

Prices per square—Standard thickness.

City or shipping point:	3/16-in.	¼-in.	5/16-in.	⅜-in.	½-in.	¾-in.	1-in.
Arvonia, Va.—Oxford gray Buckingham	14.62	18.13	23.40	26.33	32.14	40.95	
Bangor, Penn.—No. 1 clear	10.50–14.50	24.50	29.00	33.50	44.50	55.60	
No. 1 ribbon	9.00–10.25	20.00	24.50	29.00	40.00	51.25	
Gen. mediums	9.50–11.25	.....	.....	.....	.....	.....	
No. 2 ribbon	6.75– 7.25	.....	.....	.....	.....	.....	
No. 1 Albion clear	7.25–10.50	16.00	23.00	27.00	37.00	46.00	
Albion mediums	8.00– 9.00	.....	.....	.....	.....	.....	
Chapman Quarries, Penn.—No. 1	8.50–11.25	.....	.....	.....	.....	.....	
Medium	7.75– 9.00	.....	.....	.....	.....	.....	
Hard vein	.....	16.00	23.00	26.00	32.00	40.00	
Granville, N. Y.—Sea green, weathering	14.00	24.00	30.00	36.00	48.00	60.00	
Semi-weathering, green and gray	15.40	24.00	30.00	36.00	48.00	60.00	
Mottled purple and unfading green	21.00	24.00	30.00	36.00	48.00	60.00	
Red	27.50	33.50	40.00	47.50	62.50	77.50	
Monson, Maine	19.80	24.00	.....	.....	.....	.....	
Pen Argyl, Penn.*							
Graduated slate (blue)	.....	16.00	23.00	27.00	37.00	46.00	
Graduated slate (grey)	.....	18.00	25.00	29.00	39.00	48.00	
Color-tone	11.50–12.50; Vari-tone, 12.00–13.00; Cathedral gray, 14.00–15.00						
No. 1 clear (smooth text)	7.25–10.50; No. 1 clear (rough text), 8.25–9.50						
Albion-Bangor medium	8.00–9.00; No. 2 clear, 8.00–9.00; No. 1 ribbon, 8.00–8.50						
Slatedale and Slatington, Penn.—							
Genuine Franklin	11.25	22.00	26.00	30.00	40.00	50.00	
Blue Mountain No. 1	10.50	22.00	26.00	30.00	40.00	50.00	
Blue Mountain No. 1 clear	9.50	18.00	22.00	26.00	36.00	46.00	
Blue Mountain No. 2 clear	8.00	18.00	22.00	26.00	36.00	46.00	

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.
(b) Prices other than 3/16-in. thickness include nail holes.
(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.
*10% discount to roofer; 10%–8⅓% to wholesaler.

Stone-Tile Hollow Brick

Prices are net per thousand f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*	40.00	60.00	80.00
Asheville, N. C.	35.00	50.00	60.00
Atlanta, Ga.	26.50	45.00	53.00
Brownsville, Tex.*	37.50	50.00	65.00
Brunswick, Me.	35.00	45.00	60.00
Charlotte, N. C.	35.00	45.00	60.00
Farmingdale, N. Y.	37.50	50.00	60.00
Houston, Tex.	35.00	45.00	60.00
Mattituck, N. Y.	45.00	55.00	65.00
Nashville, Tenn.	30.00	49.00	57.00
New Orleans, La.	35.00	45.00	60.00
Norfolk, Va.	35.00	50.00	65.00
Passaic, N. J.	35.00	52.50	70.00
Pawtucket, R. I.	40.00	50.00	70.00
Salem, Mass.	45.00	55.00	75.00

Prices are for standard sizes—No. 4, size 3½x 4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size 3½x8x12 in.

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .12½; 12-in., .17½; 15-in., .35; 18-in., .50; 20-in., .60; 24-in., 1.00; 30-in., 1.35; 36-in.	2.00
Longview, Wash.—Drain tile, per foot: 3-in., .05; 4-in., .06; 6-in., .10; 8-in., .15; 10-in.	.20
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per 100 ft.	
3-in.	4.00
4-in.	5.00
6-in.	7.50
8-in.	10.00
Waukesha, Wis.—Drain tile, per ton	8.00

Current Prices Cement Pipe

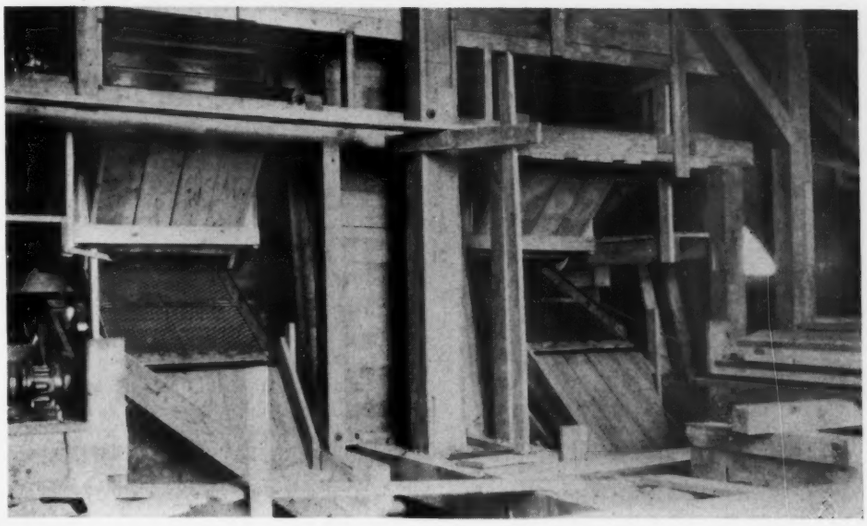
Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8-in.	10 in.	12 in.	15-in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich. (c)																	
Sewer	.10	.12	.22	.30	.40	.60	.90	1.20	.....	1.75	2.00	2.50	3.30	4.50	5.75	6.50	8.00
Culvert	.....	.....	.....	.....	.95	1.25	1.60	.....	.....	2.25	2.50	3.00	3.50	5.00	6.50	8.00	10.00
Grand Rapids, Mich. (b)	.....	.....	.....	.60	.70	.90	1.20	.....	.....	1.80	2.10	2.35	3.50	4.00	5.60	6.90	7.85
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	1.70†	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.75	.85	.90	1.15	.....	.....	1.60	.....	2.50	.....	.....	.....	.....	.....
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Newark, N. J.							6 in. to 24 in., 18.00 per ton										
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Penn.	.....	.....	.....	.....	1.08	1.25	1.65	.....	.....	2.50	.....	3.65	4.85	7.50	8.50	.....	.....
Tiskilwa, Ill. (rein.)	.....	.....	.....	.75	.85	.95	.70	1.55	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tacoma, Wash.	.15	.17	.22	.30	.40	.55	75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	.85½	.....	114	.....	.....	1.81	.....	2.47	3.42	4.13	5.63	6.49	7.31
Yakima, Wash.	.....	.....	.....	.....	.....	.....	1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78

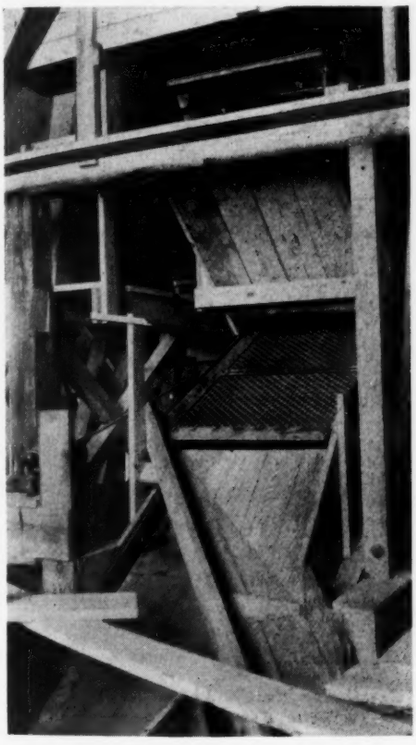
(a) 24-in. lengths. (b) Reinforced (c) Delivered on job; 5% discount, 10th of month. †21-in. diameter. ‡Price per 2-ft. length.

Improvements Under Way at the Lima Stone Co. Plant

DURING the recent period of winter inactivity the Lima Stone Co. at Lima, Ohio, has been anything but inactive. The chief work underway has been the replacement of all the revolving sizing screens with vibrators. A year ago two single-deck Niagara screens were installed, and these furnished such satisfactory service that four more are now being installed. These latter are double-deck Niagara screens and are set in two batteries of two screens each as shown in one of the illustrations. An unusual arrangement obtained by having the lower screen placed immediately below the upper one and inclined in the opposite direction saves much space in the crushing room as the illustrations indicate. Considerable work had to be done in rearranging the stone chutes in the crushing plant.



Battery of four vibrating screens installed at the plant of the Lima Stone Co., Lima, Ohio, to replace old revolving screens



Detail of the installation of one pair of vibrating screens at the Lima plant, showing the chute construction

The sizes obtained by the new arrangement are 3-in. down to 1½-in., 1½-in. to 1-in., 1-in. to ¾-in., ¾-in. to ¼-in. and ¼-in. down to dust. J. T. Lincoln, superintendent at the Lima plant, said the reason for changing to the vibrators was because of the saving in power used in operation. Each of the double-deck screens is now driven by its own 5-hp. motor, while the two single-deck screens are driven by 3-hp. motors, making a total of 26 hp. consumed. Before the change the rotary screen took an average of 100 hp., it was estimated. Mr. Lincoln said a cleaner stone also resulted.

The Lima company is also installing a new Bucyrus-Erie shovel at its Lima quarry. This is a model 100-B electric, equipped with a 3-yd. bucket. Charles Killen, general manager of the company, is directing the installation of these improvements.

British Quarry Amalgamation Announced

AN UNDERTAKING known as the British Quarrying Co. has just been formed in the United Kingdom with a share and loan capital of £1,000,000 to unite seven old-established roadstone quarries. The entire output of this group of quarries is sold out each year. The units have no bad debts, their clients being public road building authorities. The issue to the public comprises 250,000 7½% cumulative perference shares of £1 each, and £300,000 of 7% first mortgage debenture stock. Both issues were made at par.

Exclusive of good will, the combine has net assets of £820,000 ($4,100,000). Profits for the past five years have been steady, averaging £92,163 ($460,815). The present earning capacity is stated to have risen to £100,668 ($503,340).

The amalgamating quarries are John Arnold and Sons, Wickwar, established 1876; Ceirog Granite Co., Ltd., Shrewsbury, established 1881; Chittenden and Simmons, Ltd., Maidstone, established 1896; Clee Hill Dru Stone Co., Ltd., Ludlow, established 1863; Clee Hill Granite Co., Ltd., Ludlow, established 1872; Field and Mackay, Ltd., Bitterley, established 1880, and Thomas Lant, Ltd., Builth Wells, established 1896.

The seven units have a present annual output of 746,000 tons and an immediate capacity without additional capital expenditure of 1,000,000 tons. By centralizing the direction of the seven properties under one management large savings in administration and in costs will be possible. Sir Henry Maybury, G.B.E., K.C.M.G., C.B., M.I.C.E., J.P., late Director General of Roads, is chairman and managing director of the company under an agreement for five years. Sir Henry is president of the British Institute of Quarrying.

The selection of the seven units to the merger are based on (a) territorial market requirements, (b) sound industrial status, (c) possibilities for development, (d) long-established position in the trade, and (e) the recognized high quality of the material produced.

Correction

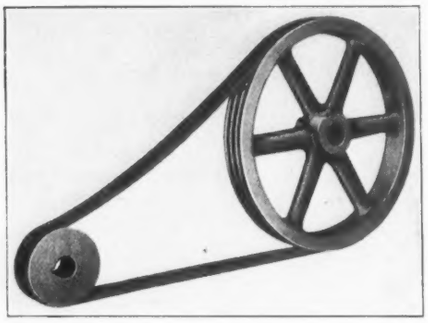
IT is desirable to correct the statement appearing in the December 22, 1928, issue of ROCK PRODUCTS, page 118, under the heading "Graphite": "Research by the Southwestern Engineering Corp. of Los Angeles, Calif., resulted in the company designing and erecting a concentration plant at Burnet, Texas, using the oil flotation process as a means of separating the graphite from the waste."

Graphite has been treated by flotation in several plants for a number of years. Although it is not known when or where graphite was first concentrated by flotation, it can safely be said that the process has been successfully used for at least 10 years, and by the Southern Consolidated Graphite Co. since 1921.

In the present mill at Burnet, Texas, described in the September 1, 1928, issue of ROCK PRODUCTS, the selection of practically all machinery and the general management of the plant was made by the Southwestern Consolidated Graphite Co.

The flow-sheet of the present plant was designated by the Southwestern Consolidated Graphite Co. based on their own experience and research.

New Machinery and Equipment



Set of sheaves and belts for a typical V-belt drive

New V-Belt Drive for Power Transmission

ONE of the most recent developments in V-belt drives is a product of Fairbanks, Morse and Co. of Chicago and is known as the "Flex-Mor" drive. The belts which are used with this drive are built up of an outer belt jacket of duck which has been treated with rubber to improve its wearing qualities. As shown in the accompanying illustration, this jacket consists of two layers of duck, enclosing a core made up of a layer of rubber, several layers of rubber-embedded cords and another layer of rubber above the cords. The layer of rubber below the cords is specially compounded to withstand repeated compression, while the layer of bubber above the cords is specially compounded to withstand repeated tension. The rubber-embedded cords are laid at the neutral axis of the belt, where there is the least tension or compression. These cords are made of long staple cotton and the construction is quite similar to that which is used in cord tires. The various elements of the belt are assembled in the mold and vulcanized.

The sheaves for this drive are made of semi-steel and have been designed with particular reference to the angle and depth of the grooves so that the belt slippage is a minimum. At the same time the relation between the angles of the belt sides and the grooves are such that the belt makes a gradual contact with the groves as it bends around the sheaves, it is claimed. Due to the wedging action of the belts in the grooves and to their inherent elastic qualities, there is no sudden grabbing of the load, the manufacturer states, and sudden shocks to the driving and driven machines are eliminated.

Drive belts are built up of duck, shown at A and B, with special compounded rubber (C and E) and layers of cords (D)

It is claimed that V-belt drives provide a greater flexibility than chain drives and give less slippage than ordinary belt drives. Bearing pressures, it is stated, are greatly reduced due to the wedging action in the groove of the sheaves which permits the belt to run with practically no tension in the return side. No belt dressing is necessary, and since little attention is required the maintenance cost is reported to be small. The "Flex-Mor" drive is stated to be the result of numerous field and dynamometer tests to determine the factors most effecting this type of power transmission.

New convertible shovel-crane built for greater speed and power

New Model Convertible Shovel

THE SPEEDER MACHINERY CORP., Cedar Rapids, Iowa, introduced and showed for the first time at the National Road Show, the improved Speeder Model B-3, which is claimed to be much faster and more powerful than previous models.

This model is stated to have a hoist line speed of 180 f.p.m., a swing speed of more than 4 r.p.m., and a travel speed of 1½ actual m.p.h. in high gear, and 0.55 h.p.h. in low gear. In low gear the machine will climb a 35% grade, it is claimed.

The patented Speeder direct-cable crowd is used. The working principle is the same as in previous models but it is improved by the use of two short cables rather than one long cable thus necessitating the replacement of only a short cable rather than the long cable in case of breakage. The speed of the crowding action also has been increased.

The improved Speeder, Model B-3, as a shovel has for standard equipment a boom 18 ft. in length and as a crane carries either a 30- or 35 ft. boom and the working load is 10,000 lb.

Pocket Size Blasting Machine

THE Hercules Powder Co. of Wilmington, Del., has announced a new pocket size blasting machine which is declared to be a new departure in American electrical machine design. The company states that it is the first machine of American design to apply the dynamo principle to a blasting machine of such compactness. It weighs only 4¾ lb. and will slip into an ordinary coat pocket. It is claimed that the dynamo principle assures permanent capacity in contrast to the old magneto type which lost power with age. The machine is rated to fire ten electric blasting caps connected in series, but the company states that all tests have shown a 100% reserve power.

Small size blasting machine which uses the dynamo principle

The new machine is the development of three years work and experiment by the company's engineers. It is called the "Hercules 10-Cap Blasting Machine," and is an extremely convenient size for any kind of blasting of not more than 10 holes.

New 8-Wheel Drive for Trucks

THE Browning Crane Co., Cleveland, Ohio, recently announced the Browning-Christie 8-wheel drive for Browning truck cranes and all types of heavy duty motor trucks. The new drive consists of eight driving wheels mounted in a compact, sturdy unit installed on any motor truck to replace the two ordinary rear wheels of the truck. Having four times the traction of the two normal driving wheels, the 8-wheel drive will pull a truck through axle-deep mud, snow, sand or ruts that would mire the ordinary truck, the manufacturers claim.

The design of the unit and method of mounting to the truck permits absolute equalization of the load on all eight wheels, according to the company, so that rough ground, ruts, holes, logs and railroad tracks offer no obstacle to its easy operation. Even in plowing through hub-deep bogs this 8-wheel driving unit has ample clearance, it is claimed, enabling it to go almost anywhere under its own power without danger of digging itself in. Because of the 8-point load distribution and 8-point traction, the Browning-Christie drive can be used where an ordinary truck would find the going impossible. Consequently the field of usefulness of a truck equipped with this 8-wheel drive is greatly increased, the manufacturers claim.

There is also another feature of this 8-wheel drive which gives any truck equipped with it a dual utility. The eight driving wheels are arranged in a tandem of pairs to each side, so placed and spaced to accommodate a crawler tread. These crawler treads which operate around the front and back pair of wheels on each side transform the eight driving wheels into two large, powerful crawlers, making the truck a crawler drive whenever desired. When operating in this manner, steering is accomplished in the normal manner with the front wheels of the truck.

The treads are standard equipment with the drive, and are so designed and built that they can be attached or removed quickly, just like tire chains. Where the conditions are unusually adverse for the eight wheels, the crawler treads make the going passable. When back on more solid ground the treads can be quickly removed and normal driving speed can be resumed.

The eight driving wheels are what are known as the displacement type and are generally equipped with solid tires. Pneumatic tires can, however, be secured if desired. The unit can be attached to any truck to give it a dual utility—the speed of the truck plus the power of the crawler in one unit.

New Truck Body for Ready-Mixed Concrete

A NEW truck body for handling ready-mixed concrete has recently been announced by the Barlett and Snow Co., Cleveland, Ohio. This unit is distinctly different

Truck body for hauling ready-mixed concrete has new features

in some of its features, one of which is the movable side plates of the body, which are placed in a "V" position while the truck is receiving its load, but which are wound back to a vertical position when the truck arrives at its destination and is about to unload. The company states that the movement of the plates causes the load to be spread over the entire bottom of the truck and so mixes any fluid that may have been segregated during transportation into the whole mass. It is claimed that this corrects any segregation, and that no mechanical agitation of any kind is required.

In dumping, the body is tilted and the mix again receives a churning action as it passes through the end gates. The concrete which pours from the tail piece is as plastic and workable as when it left the mixer, the manufacturers claim. The body performs the function of correcting any separation to the complete satisfaction of every engineer who has inspected it, the company states, and tests taken at wide intervals prove that the concrete delivered in the body up to the time limit set by haulage costs is in every respect equal to that delivered by the mixer at the central plant, according to the announcement.

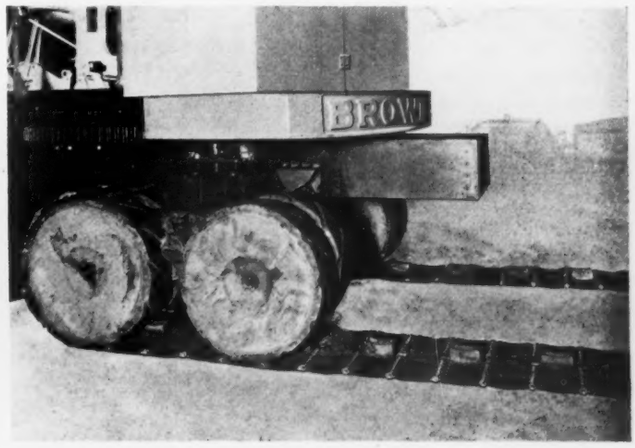
There are no mechanical baffles or obstructions of any kind inside the Bartlett-Snow body. This feature makes it suitable for the additional duty of general hauling. With the sides in a vertical position, it forms an ordinary rectangular end dump body for sand, gravel and similar materials.

Other advantages claimed for this unit are its relatively low initial cost, its lack of revolving mechanical parts to wear out, and its light weight.

Pipe Manufacturer Changes Name of Company

THE name of the American Spiral Pipe Works, of Chicago, Ill., has been changed to the Taylor Forge and Pipe Works. The change of title became effective on March 30, 1929. According to the announcement there will be no change in ownership nor in the capital structure, the new name being assumed simply for the convenience of customers since many were unfamiliar with the company's wide range of products. The company produces all kinds of equipment for high pressure service.

New 8-wheel drive on a truck showing the type of ruts and bad ground conditions which can be negotiated with the drive



The crawler treads on the 8-wheel drive are put on like ordinary tire chains, but are only necessary under the most adverse conditions

New York State Crushed Stone Men Meet at Syracuse

A WELL ATTENDED and very interesting meeting of the New York State Crushed Stone Association was held Friday, April 5, at the Hotel Syracuse, Syracuse, N. Y.

Members gathered early to "swap" stories about their winter repairs and new installations, how their golf games were going, and the sizes of the various catches of fish off the Florida coast during vacation. Everybody was bubbling over with enthusiasm and good fellowship, and since the state legislature had passed the 2c. gas tax and more funds for road building seemed probable, the operating season just opening seemed fraught with favorable opportunities for a successful year for the industry.

About 11 a. m., the business meeting was opened, President James Savage, of the Buffalo Crushed Stone Co., Buffalo, in the chair, and A. S. Owens of the Peerless Quarries, Utica, taking over the duties as secretary and treasurer.

Minutes of the previous meeting at Cleveland having been approved, the members launched into a discussion of uniform terms of credit. President Savage advised of receipt of a letter from Secretary Hayes of the State Contractors Association bearing upon the subject. It was brought out that with the single exception of the Solvay Process Co. all companies had a discount system in effect, and the terms, while not all uniform, were nevertheless very similar in nature. Mr. Kaiser of the Solvay company explained the reason for his firm's action, but agreed to take up the matter with his credit department to ascertain if its terms could not be brought into closer conformity with the rest of the membership.

President Savage then spoke of the committee representation at the Albany legislative hearing, and also with representatives of the Contractors' Association, and told of having attended a meeting in Albany of the newly formed alliance of business organization which is fostering the establishment in the state government of an agency comparable to a department of commerce. He stated that in his opinion the New York State Crushed Stone Association should join this alliance, and mentioned that the annual dues were $25. After some discussion, it was decided to leave the matter to the judgment of the chair, and it will be taken up again at the next meeting.

When it was stated that during the past winter, one of the members, Harry Lancaster, of the L. & M. Stone Co., Utica, N. Y., had passed to his reward, W. L. Sporborg offered a resolution of condolence to be transmitted to the family of the deceased member, and also spread upon the minutes of the association. President Savage was authorized to take such action.

Attention was called to a letter received from Mrs. Otho M. Graves of Easton, Penn., very graciously thanking the association for the beautiful silver service presented to Mr. Graves at the national convention at Cleveland last January.

A recess was then taken for luncheon at which 27 participated, and the business meeting resumed at about two o'clock.

A. G. Seitz explained the ruling of the State Department necessitating one day rest in seven for plant employees in the labor class, and how such rest days should be posted upon conspicuous bulletin boards to conform with state requirements. Discussion developed the fact that member companies were obeying the law with respect to this one day rest per week, and that if men were obliged to work on Sundays for necessary or exceptional repairs, they were being given their allotted rest period during the subsequent week.

President Savage then spoke of his committee appointments and named but a membership committee at this meeting, deferring the appointment of others until a later date. The membership committee is composed of Geo. E. Schaefer of the General Crushed Stone Co., Rochester, chairman; F. C. Owens, Rock-Cut Stone Co., Auburn; and secretary, A. S. Owens, Peerless Quarries, Utica. President Savage requested authority to increase the personnel of the executive committee to include past-presidents, in addition to the current officers. Since the by-laws designated but two others in addition to the officers, and there are now four past-presidents, the change was approved.

Quarry Merger

Upon request Mr. Sporborg then officially informed the association of the merger of the General Crushed Stone Co. and the Rock-Cut Stone Co.

Outlines of present and future conditions as to the business outlook were then requested of a number of members in all sections of the state, and the time in general was favorable with anticipation of good tonnages and financial success. In one or two localities competition with other aggregates was mentioned, but prices apparently are reasonable and stationary.

John Odenbach, president, Dolomite Products Co., Rochester, invited the members to meet at his "all-stone castle" for the next gathering, and it was so decided with thanks, the date specified being May 7.

Other routine business was then completed and the meeting adjourned at 4:30 o'clock.

Registration

James Savage and A. J. Hooker, Buffalo Crushed Stone Co., Buffalo.

J. L. Heimlich and Mr. Moore, LeRoy Lime and Crushed Stone Co., LeRoy.

W. E. Foote, Wickwire-Spencer Steel Corp., Gasport.

John Odenbach, Harvey Clark and Arthur Sickles, Dolomite Products Co., Rochester.

Geo. E. Schaefer and Grover J. Murphy, General Crushed Stone Co., Rochester and Little Falls.

W. L. Sporborg, H. G. Seitz, Owens and McLaughlin, Rock-Cut Stone Co., Syracuse.

Grant A. Hunter, F. E. Conley Stone Co., Utica.

A. S. Owens, Peerless Quarries, Inc., Utica.

William McGrew, L. & M. Stone Co., Prospect.

A. B. Caldwell, Buckholtz and Whitlock, Genesee Stone Products Co., Batavia.

F. W. Schmidt, Morristown Crushed Stone Co., Morristown, N. J.

B. R. Babcock, Callanan Stone Co., Albany.

H. J. Russell, Glens Falls Stone Co., Glens Falls.

F. H. Kaiser, Solvay Sales Corp., Syracuse.

William Anderson, Hercules Powder Co., Buffalo.

Darroll Cheney, Marion Steam Shovel Co., Buffalo.

Also as a guest, a representative of E. I. du Pont de Nemours and Co.

J. W. Peters Sand and Gravel Company Sold

J. W. PETERS SAND AND GRAVEL Co., a $150,000 concern, Burlington, Ill., was sold recently to the Northshore Materials Co., Libertyville, Ill., at a price which was not revealed.

The rapidly growing business, established in 1926 by John W. Peters, is thus absorbed by one of the largest sand and gravel firms in this section of the middle west.

Transaction in which the J. W. Peters Sand and Gravel Co. plant, which has been doing an annual business of $100,000, becomes a branch of the Northshore Materials Co., followed six months of negotiations and investigations by engineers of the Northshore firm.

Mr. Peters will continue to do a general trucking business with offices at East Washington street and will supply consumers in the Burlington territory with sand and gravel purchased at the pits.

The property sold includes two separate parcels of land, one 20 acres in size and the other 86 acres. Plant and equipment are located on the 20-acre tract, which engineers of the Northshore Materials Co. report will not be depleted for three more years. The 86-acre tract, as yet undeveloped, will furnish stone for 25 years to come, they said.

Property involved included 106 acres of land containing a large gravel pit and crushing and gravel washing machinery. The property is located in the southwestern part of Burlington, adjacent to the Chicago, Milwaukee, St. Paul and Pacific railroad.

Otto A. Cheska, vice-president of the Northshore Materials Co., said his firm contemplates doubling the production of sand and gravel from the local pits and that the company's program of expansion, which includes the crushed-stone plant at Racine and the sand and gravel plant at Libertyville, will enable his firm to produce and market one million tons of sand, gravel and stone annually from the three plants.—*Burlington* (Wis.) *Free Press.*

Col. J. W. Fuller Dies in San Francisco

COL. JAMES W. FULLER of Allentown, Penn., president of the Fuller Co. of Catasauqua, Penn., and a descendant of Dr. Samuel Fuller, the physician on the original Pilgrim ship *Mayflower,* died at 4 a. m., April 4, in St. Luke's hospital at San Francisco, Calif.

He went to California in February on business, and, accompanied by his wife, extended the trip to Honolulu. He was taken ill on the return voyage, death being the result of sleeping sickness caused by the bite of an insect.

Colonel Fuller was 56 on April 2. He was president of the Allentown Portland Cement Co., the Valley Forge Cement Co. of Conshohocken, as well as of the Fuller Co., manufacturers of the Fuller-Kinyon pneumatic pump and other machinery. He was also one of the founders of the Fuller-Lehigh Co., Fullerton, Penn.

He was a multi-millionaire, and became a colonel through appointment by Governor Tener of Pennsylvania.

He developed Willowbrook Farm, near Catasauqua, where he raised prize Jerseys and Persian and Arabian horses.

He was a member of the Mayflower Society. Surviving are his wife and two sons, James W. Fuller, 4th, and Thomas Fuller.—*Philadelphia* (Penn.) *Bulletin.*

A 94-Ft. Belt Conveyor Boom Hauled Five Miles on Sleds

THE STURGEON BAY CO. solved an interesting problem recently when they shipped a huge 60-in. belt conveyor boom, 94 ft. long, from the Stephens-Adamson plant at Aurora, Ill., up to Sturgeon Bay, Wis.

The Sturgeon Bay Co. is building a new plant and installing a system of Stephens-Adamson conveyors to handle, store and load crushed stone into freight boats for shipment to Great Lake ports. Both firms are making every effort to complete the new plant before Lake Michigan opens up for spring traffic.

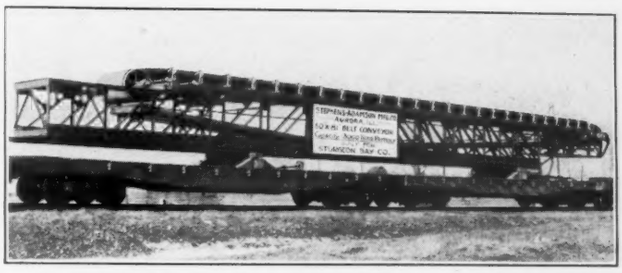
One of the larger units is a 60-in. by 82-ft. shuttle belt conveyor, designed to roll out over the big freight boats and fill them at a rate of 3000 tons per hour. The completed conveyor and steel frame is 94 ft. long, 7 ft. wide and 9 ft. 3 in. high.

It was decided that several valuable working days would be saved if the conveyor could be assembled in the Stephens-Adamson shops and shipped complete, ready to operate.

The illustration shows how the completed unit was shipped on two flat cars after special permission had been obtained from the railroad. A flexible support was built in the middle of each car and the conveyor anchored against wind and side sway by means of cables. It can be seen how this mounting enabled the cars to pivot as they were drawn around curves.

At Sturgeon Bay the big conveyor was lifted from the cars to two specially constructed sheds which had previously been prepared. Powerful trucks were hitched to the boom and finally five of them hauled it for over five miles to the Sturgeon Bay plant.

Here a 120-B Bucyrus shovel was used to lift the huge conveyor and roll it on to the tracks built to handle 3000 tons of stone per hour.



Large conveyor for the new plant of the Sturgeon Bay Co. which was hauled five mills on sleds to get it to the plant

John Sankey Elected President of Illinois Sand and Gravel Association

THE RECENT ANNUAL MEETING of the Illinois Sand and Gravel Association, held at the Abraham Lincoln Hotel, Springfield, Ill., was marked by a most representative attendance of the producers of the state. No formal program was arranged, but ample time was had after the luncheon which opened the meeting for informal discussion of business conditions within the industry and the outlook for 1929.

President Ellingen made a report on various activities of the Illinois Association since the last meeting, and secretary Weaver read the minutes of the gathering. Stanton Walker and V. P. Ahearn of the National Sand and Gravel Association were guests of the meeting and were called upon to discuss the program of the national organization for the coming year.

The following were elected to serve as officers of the Illinois Association in 1929: John E. Sankey, president; J. C. Brandt, vice-president; R. E. Weaver, secretary-treasurer; J. P. Cantlon and H. J. Larkin, members of the executive committee.

The registration list included the following members:

J. P. Cantlon, Neal Gravel Co., Mattoon, Ill.
O. J. Ellingen, H. D. Conkey and Co., Mendota, Ill.
H. H. Halliday, H. H. Halliday Sand Co., Cairo, Ill.
H. J. Larkin, Rock Island Sand and Gravel Co., Rock Island, Ill.
T. E. McGrath, McGrath Sand and Gravel Co., Lincoln, Ill.
H. L. McGurk, Interstate Gravel Co., Terre Haute, Ind.
K. R. Misner, Western Indiana Gravel Co., Lafayette, Ind.
D. O'Keefe, Springfield-Pekin Sand and Gravel Co., Springfield, Ill.
J. E. Sankey, Joliet Gravel Co., Springfield.
C. S. Schmoeller, Mississippi Lime and Material Co., Alton, Ill.
W. R. Spence, W. R. Spence Co., Hannibal, Mo.
Ben Stone, Merom Gravel Co,. Indianapolis, Ind.
R. E. Weaver, The Lincoln Sand and Gravel Co., Lincoln, Ill.
Ben Woods, Beder Woods' Sons' Co., Moline, Ill.

—*National Sand and Gravel Bulletin.*

Contract Prices for Stone

THREE CONTRACTS were awarded and one deferred at the regular meeting of the council of Bloomington, Ind., recently.

The contract for crushed stone to be used in city street repairs was awarded to the Bloomington Stone Co. at $1.25 per cu. yd. The only other bidder was the Monroe County Stone Co. at $1.44 per cu. yd.

OWNERSHIP OF ROCK PRODUCTS

Statement of the ownership, management, circulation, etc., required by the Act of Congress of August 24, 1912, of ROCK PRODUCTS, published every second Saturday at 542 South Dearborn street, Chicago, Ill., for April, 1929, State of Illinois, County of Cook, ss.

Before me, a notary public in and for the state and county aforesaid, personally appeared Nathan C. Rockwood, who, having been duly sworn according to law, deposes and says that he is the manager of ROCK PRODUCTS, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse side of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Tradepress Publishing Corp.; Editor, Nathan C. Rockwood; Managing Editor, None; Business Manager, Nathan C. Rockwood.

2. That the owners of 1% or more of the total amount of stock are: W. D. Callender, Nathan C. Rockwood, both of 542 South Dearborn street, Chicago, Ill.

3. That there are no bondholders, mortgagees, or other security holders owning or holding 1% or more of total amount of bonds, mortgages or other securities.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest, direct or indirect, in the said stock, bonds, or other securities than as so stated by him.

NATHAN C. ROCKWOOD,
Business Manager.

Sworn to and subscribed before me this 6th day of April, 1928.

(SEAL) CHARLES O. NELSON.

(My commission expires April 13, 1930.)

News of All the Industry

Incorporations

Pontiac Gravel Co., Mount Clemens, Mich., $50,000.

Shore Acre Sand and Gravel, Jamestown, N. Y., $100,000.

Peck-Thomson Sand Co. (Missouri), $10,000 capital in Kansas.

Brick and Foundry Sand Co., 18304 Lahser, Detroit, $3000. Sand.

West Virginia Lime and Stone Corp., New York City, 2,000,000 shares.

British Columbia Gravel Distributors, Ltd., Vancouver, B. C., $25,000.

Southern Gravel Co., Houston, Tex., increasing capital stock from $15,000 to $90,000.

Simpson County Gravel Co., Inc., Saratoga, Miss., capital increased from $10,000 to $30,000.

Blue Creek Stone Co., Decatur, Ind., $10,000. Theodore W. Baker, John Hisey, Lee Boehm. Stone, gravel.

United Sand and Gravel Co., Canton, Ohio, $500, 1000 shares, no par. William Timpe, David B. Day, M. L. McCann.

Lincoln County Gravel Co., Brookhaven, Miss., $150,000, 1500 shares, par $100. N. W. Rockett, H. E. Major, Hattiesburg, Miss.

Southern Feldspar Co., Bakersville, Ga., $50,000. J. A. Dennis, P. B. Bullard, Keene, N. H.; Charles E. Greene, Bakersville, and others.

Industrial Mineral Corp., Asheville, N. C. $100,000. J. A. McAkee, 55 Sherwood Rd., Forest Hill, N. C.; R. P. Booth, Flat Iron Bldg., Asheville.

Port Wells Granite Co., $100,000, 1000 shares of $100 each. G. W. Duncan, Frances C. Duncan, Percy P. Brush, N. O. Cruven, Tacoma, and L. A. Levensaler, Seattle, Wash.

Jersey Gravel Co., Hamburg, N. J., $50,000 preferred and 2000 shares common, no par. Harrison Osborne, Clara C. Ohman, New York; Walter C. Diggs, attorney, Hamburg.

Southern Building Block Corp., Charleston, S. C., $5000, 50 shares of $100. M. C. Winchell, president; Jack Rephan, vice-president; P. A. Winchell, secretary; Hyman Rephan, treasurer.

Barre Crushed Stone Co., Inc., Barre, Vt., 200 shares common, $100 par each. E. M. Stevens, R. J. Coe, F. C. Gleason. Crushed granite, cast stone, concrete products, plaster and stucco.

Quarries

Crushed Stone Co., Marietta, S. C., it is reported, will erect a $50,000 plant.

Mueller-Gray Quarry Co., Perryville, Mo., is establishing a new crushed-stone plant.

Danville, Ky.—W. P. Caldwell, Virgil Reid and Robert Gwinn have purchased the rock quarry business of Taylor Bros., which is one of the largest concerns of its kind in this section of the state.

Osawatomie, Kan.—E. P. Hawkins, retired highway division engineer, has arranged to open a rock quarry near Garnett which will soon be prepared to furnish limestone rock for highway work and agricultural limestone to farmers in eastern Kansas. The highways in Miami county during the past two weeks, except where paved and graveled, have been almost impassable.

Carrollton, Mo.—Rock by the carload is being removed from the White Rock quarry. One hundred and twenty-five men are at work in the quarry removing the material for government river bank protection, which will be under way in the near future. The rock is at present being piled near the quarry. The mountains of rock will later be transported to the various places along the river where the improvement program is now under contract. A larger force of men will be employed at the quarry in the near future.

Sand and Gravel

Cooley Gravel Co., Indianapolis, Ind., has purchased the Sampsel gravel pit near Sampsel, Mo., from the Johnson-Hudson Gravel Co., Carrolton, Mo. The owners state several improvements are planned for the Sampsell plant in the near future.

McComb, Miss.—The newest industry in this section is a plant for washing gravel on Clear Creek, four miles east of McComb, erected by A. P. Johnston and Ed Lawrence. Two cars of gravel were delivered from the plant this week. It is said that there is a bed of hundreds of carloads of gravel at a bend in the creek and the owners are utilizing this raw product. Street paving and many other building projects in this section require the use of a large amount of washed gravel, and the new plant will fill this need.

Sheffield Sand and Gravel Co., Sheffield, Ala.; a large fleet of boats belonging to the company arrived at the Garlands Ferry, Ala., recently. The fleet is composed of the steamer *Rita*, the dredge boat *Vandeburg*, and six barges, and is under the command of Capt. Conway Garden, with J. H. Darby as chief engineer and a crew of ten men. This company has the contract to furnish all the gravel used in the construction of the bridge at this point and it will require about 40 days after the river goes down to begin operation. Capt. Conway for years operated boats for the Tennessee River Navigation Co.

Cement

Alpha Portland Cement Co., Phoenix plant, Birmingham, Ala., entertained the senior class of engineers of the University of Alabama, April 11, when the plant was inspected.

Huron Portland Cement Co., Detroit, Mich., is reported to have purchased additional water front property at Toledo, Ohio, where construction of a cement storage and distributing warehouse will be started immediately.

Kosmos Portland Cement Co., Kosmosdale, Ky., will contribute prize money for farm demonstrations by county teams of the 4-H Clubs, comprising 500 farm boys and girls in 85 counties of Kentucky, to meet at the University of Kentucky, June 10-15.

Monolith Portland Cement Co., Los Angeles, Calif.: Election of Alfred F. Smith as chairman of the executive committee of the company at a meeting of the board of directors was announced recently by Coy Burnett, president of the organization. The position of Mr. Smith is a new one created by the company and he will be the chief executive of the concern on the Pacific Coast. While Mr. Smith is now one of the largest stockholders of the company, no change of ownership or control of the organization has resulted because of his election, it is stated.

Michigan State Cement Plant. Prospects of selling the state cement plant, at Chelsea, Mich., are discouraging, according to the governor's message to the legislature, because of the fact that the properties, long since obsolete, could not be used by private interests for the manufacture of cement at a profit. It was pointed out that never in the history of the plant under three managements has the property yielded a profit. A report reveals that the cement plant has overdrawn from the state industrial fund more than $700,000. A bill authorizing the sale of the plant has been drafted by the attorney general. It is not certain whether or not there are any probable purchasers in case the state should offer to sell.

Silica Sand

Crystal Silica Sand Co., Oceanside, Calif., is shipping a car of glass sand per day to a Los Angeles user. The sand is mined from a hillside directly above the Santa Fe tracks, pulled up to a belt conveyor by a team and scraper, carried by the belt to washers, dryers and then to the screen, where the final process is the grading of the sand. Four very excellent grades are produced by this plant. Many extensive improvements and increase in production are planned by the officials of the plant.

Eastern Silica and Chemical Co., Winchester, Va., which some months ago acquired the property and business of the Winchester Glass Sand Co., in the vicinity of Gore, Frederick county, recently completed the installation of new machinery and other equipment, and is now operating the plant on full time. Approximately 25 men are employed at the plant. Some are getting out the sand, and others are grinding and pulverizing and loading it into cars on the tracks of the Winchester and Western Railroad for shipment to large eastern markets.

Lime

National Lime, Cement and Byproducts Corp., Tuscumbia, Ala.; State Geologist W. B. Jones and State Chemist Dr. J. S. Loud were in Sheffield and Tuscumbia recently, with Thomas K. Morris, vice-president of the National Lime, Cement and Byproducts Corp., inspecting the lime property and shale deposits of the company at its plant west of Tuscumbia.

Personals

Walter J. Miller has been elected a director and vice-president of the Foote Bros. Gear & Machine Co., Chicago, Ill.

Major Segrave, who won the Daytona Beach automobile speed contest with a car he drove 231 miles per hour, is a cement manufacturer when he is home in England.

O. W. Merrell, recently district engineer, Ohio state highway department, has joined the promotional staff of the Universal Portand Cement Co., with headquarters at Columbus, Ohio.

T. J. Bray, Jr., assistant to the general superintendent of the Republic Iron & Steel Co., Youngstown, Ohio, has resigned that position to join the sales department of Koppers Construction Co., Chicago.

Frank J. Griswold, who recently retired as vice-president and general manager of the American Gypsum Co., Port Clinton, Ohio, is taking his first real vacation in years. With Mrs. Griswold he is visiting Florida and Louisiana.

Duff A. Abrams, director of research, International Cement Corp., New York City, was the principal speaker at a dinner meeting of the Indiana Engineering Society at Indianapolis on March 19. His subject was "Cement."

Arthur W. Cutten was elected a director of Baldwin Locomotive Works, Philadelphia, Penn., at the recent annual meeting of the company, to fill the vacancy caused by the resignation of Robert P. Lamont, newly appointed Secretary of Commerce. Mr. Cutten resigned as a director of Baldwin several months ago and was succeeded by Mr. Lamont.

Col. John Stephen Sewell, president of the Alabama Marble Co., Birmingham, Ala., has been appointed a member of the commission, to serve under Gen. Charles G. Dawes, former vice-president of the United States, to study the fiscal affairs of the republic of Santo Domingo. Colonel Sewell is a West Point graduate who resigned his commission prior to the World War to take the presidency of the Alabama Marble Co. He reentered the army during the war and was colonel of the regiment in which General Dawes was lieutenant colonel.

Marshall Keig, recently vice-president of the Consumers Co., Chicago, Ill., resigned to found Marshall Keig and Co., capitalized at $500,000, to deal in coal, building material and mechanical refrigerators. "I have been working for big corporations for years and after nursing the idea along for some time I have finally decided to try and make a go of one myself," Mr. Keig said in making the announcement. "After things are working smoothly I hope to be able to relax a little, something which I haven't been able to do for years." Before entering the signal corps of the army during the war Mr. Keig was secretary-treasurer of Harry Vissering and Co., and the Okadee Company, and vice-president of the Charles R. Long Co., Louisville. Previous to that he had been connected with the Atchison, Topeka and Santa Fe railroad. W. O. Hawkins will succeed him as vice-president of the Consumers' company.